

Final Report

March 1997

Prepared for:
**Williams Gateway
Airport Authority**
and
**Maricopa County
Department of
Transportation**

Prepared by:



JHK & Associates
An SAIC Company

in Association with:

Lima & Associates
Transit Plus
Applied Economics

Williams Area Transportation Plan



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Final Report

WILLIAMS AREA TRANSPORTATION PLAN

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This report was adopted by the Williams Gateway Airport Authority Board on March 5, 1997, and by the Maricopa County Board of Supervisors on March 26, 1997.

Preparation of the Williams Area Transportation Plan was accomplished by professional consultants under contract to Williams Gateway Airport Authority through Economic Development Administration Grant No. 07-49-03442. The statements, findings, conclusions, recommendations, and other data in this plan are solely those of the contractor and do not necessarily reflect the views of the Economic Development Administration.

JHK70037

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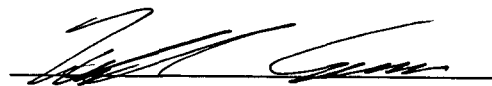
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Our thanks to these individuals for their interest and input.



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1. INTRODUCTION

BACKGROUND

Maricopa County is currently developing a Comprehensive Land Use Plan for the unincorporated areas of the County which includes a County-wide Transportation System Plan. As companion efforts to the overall Transportation System Plan, the County is preparing transportation studies for all areas of the County. The Williams Area Transportation Plan generally covers the unincorporated area of the county south and east of Chandler, Gilbert, and Mesa and includes the Town of Queen Creek (Figure 1-1).

A major growth node in the study area is the former Williams Air Force Base (WAFB) property. The 4,052 acre Air Force Base was announced for closure in July of 1991, and officially closed on September 30, 1993. The Economic Reuse Plan for Williams was completed in August of 1992. It includes a reliever airport and an aerospace center planned to accommodate general aviation, cargo, and commercial passenger service, aerospace manufacturing, maintenance and modification. The Reuse Plan also includes an education, research and training campus (Williams Campus) on approximately 900 acres. The Williams Campus involves Arizona State University East Campus and the Maricopa Community College District as its two primary members. Other institutions included in the campus are: the University of North Dakota Aerospace Flight Training Center, Embry-Riddle Aeronautical University, the Maricopa Regional School District, Project Challenge, Armstrong Laboratory, homeless providers, and the Veteran's Administration. Williams Gateway Airport began operations in March of 1994. ASU East began classes in January of 1995.

Following the adoption of the Economic Reuse Plan, the Williams Air Force Base Master Plan was developed for the Williams Gateway Airport. The plan forecasts roughly 287,000 annual operations by the year 2015. The airport property is planned for approximately 3,020 acres, including 1,000 acres of planned industrial/commercial land which surrounds the airfield.

The Environmental Impact Statement (EIS) was generated by the Air Force for the Base and was completed in July of 1994. The EIS Record of Decision for the property has

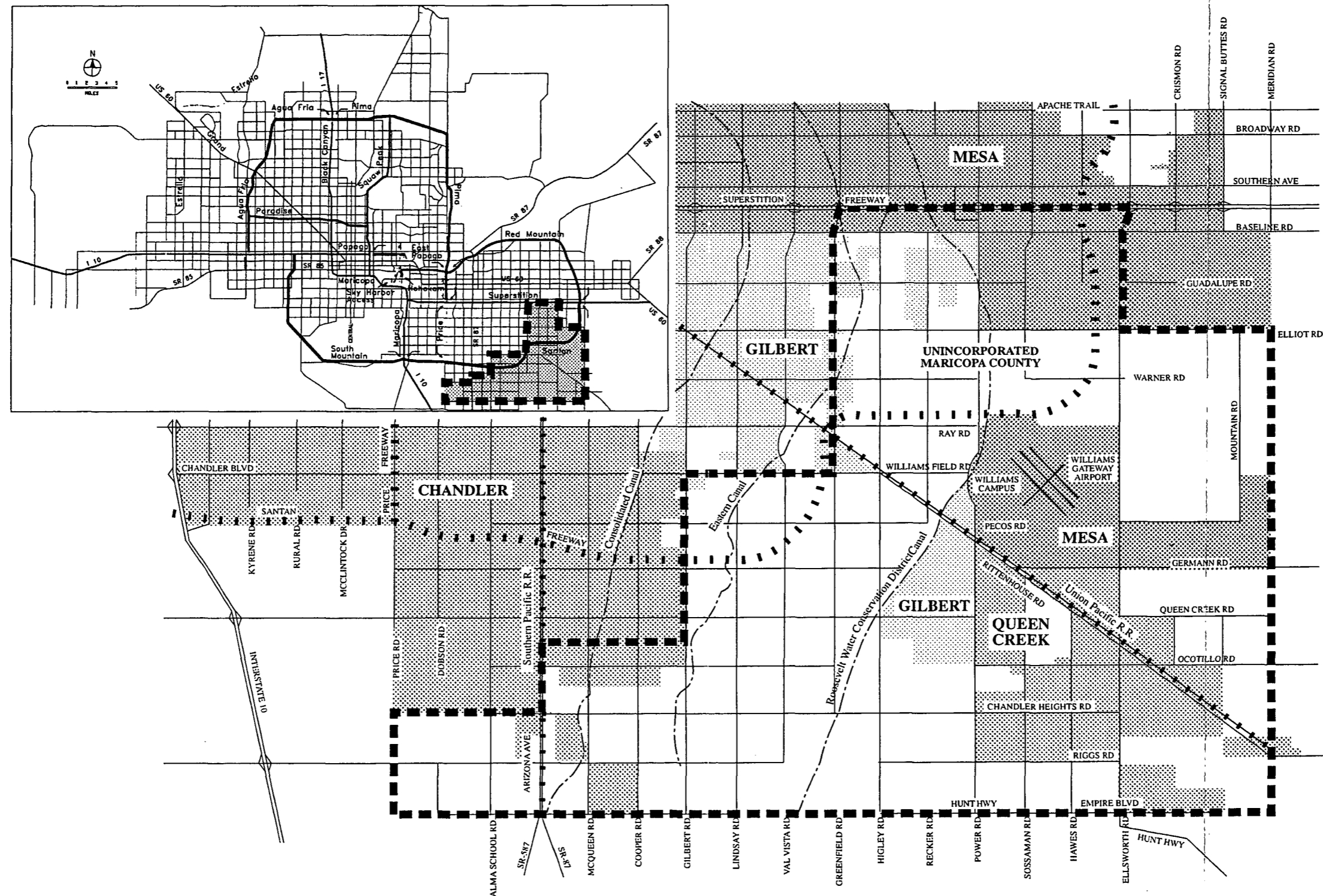


Figure 1-1
Vicinity Map - Williams Area

been finalized and property is in the process of being transferred from the Air Force. The Strategic Economic Development Plan and Industrial/Commercial Master Plan for Williams Gateway Airport was completed in April of 1995 and the Williams Campus Master Plan was completed in January of 1996.

The area surrounding the airport and campus (Southeast Maricopa County) is generally remote, with low density residential uses scattered throughout the area. However, recent growth in and around Gilbert and Chandler has been at medium densities in the form of master planned communities and large subdivisions. The road network, although rural in nature, is generally well served by a grid system. The continuity of the grid system is interrupted at the Williams Gateway Airport and the General Motors Proving Grounds. The area is traversed by the Union Pacific Railroad which runs diagonally through the area paralleling Rittenhouse Road.

The area contains some of the prime agricultural land in the valley and has a long history of intensive agricultural use. Agriculture and agri-business uses still predominate throughout the area, but have declined in recent years as agricultural lands have been turned over to residential development.

A number of studies to plan for the growth in this area—the Williams Regional Planning Study, the City of Mesa General Plan Update, the Town of Queen Creek General Plan Update, have been completed and adopted during the course of this study and the Maricopa County Comprehensive Land Use Plan—is under development.

The closure of the Williams Air Force Base in 1993, and its subsequent rebirth as the Williams Gateway Airport and the Williams Campus, offers the potential for substantial economic and development impact on the site and the surrounding area. One of the keys to realizing this potential is to plan for, and implement, transportation improvements in the region. Without the means to transport people and products effectively, economic development within the area may be constrained. It is this reality that the Williams Area Transportation Plan (WATP) seeks to address. That is, to identify transportation improvement needs to safely and effectively handle future traffic volumes in Southeast Maricopa County.

STUDY AREA

The study area for the WATP (Figure 1-1) covers approximately 144 square miles in the southeast corner of Maricopa County. The Maricopa County/Pinal County line borders the east and south sides of the study area. The Gila River Indian Community is just south of the study area in Pinal County.

The Superstition Freeway (US 60) borders the north side of the study area. The western boundary of the study area varies from Greenfield Road to Price Road. The study area includes portions of Chandler, Gilbert, Mesa, all of Queen Creek which is within Maricopa County and surrounding unincorporated areas of Maricopa County. The Williams Gateway Airport (WGA) and the Williams Campus are located within the study area.

For this report, the study area will be referred to as the Williams Area and the transportation plan as the Williams Area Transportation Plan.

TRANSPORTATION PLANNING PROCESS

The WATP was prepared by a team of consultants lead by JHK & Associates. Other team members included Applied Economics, Lima & Associates, and Transit Plus. The consultant team was guided by a Project Advisory Committee made up of representatives from Maricopa County, Williams Gateway Airport Authority, Arizona State University-East Campus, City of Chandler, Town of Gilbert, City of Mesa, Pinal County, Town of Queen Creek, RPTA/Valley Metro, MAG, and the Arizona Department of Transportation. Additional input was provided by the Town of Apache Junction, Gila River Indian Community, and private citizens. Several steps were taken in developing the WATP:

- Compiling information on the existing and planned transportation system for the Williams Area. A summary of this information is presented in Chapter 2.
- Compiling information on existing and future land uses and developing socio-economic projections for the Williams Area. A summary of this information is presented in Chapter 3.
- Developing a travel demand model for the Williams Area which is discussed in Chapter 4.

- Evaluating the existing and planned transportation system by running the travel demand model with the updated socioeconomic projections. Chapter 5 presents the results of this traffic analysis.
- Recommending improvements for the transportation system and identifying an implementation plan including possible funding mechanisms for the recommended improvements. Chapter 6 presents the Williams Area Transportation Plan and recommended improvements.

The WATP is a living document. The growth projections upon which the WATP are based need to be monitored and the Plan needs to be updated if conditions change significantly, e.g., if the population or employment in any zone exceeds the five year projection by 20 percent or more. The Plan should be updated at a minimum every five years—the depth of the update depending upon both the difference between the projected growth and actual growth, and the planned versus actual implementation of the WATP.

2. TRANSPORTATION AND ENVIRONMENTAL DATABASE

This chapter provides an overview of the environmental and existing transportation service features within the study area.

ENVIRONMENTAL INVENTORY

Land Use

The Williams Area lies in a valley between the Goldfield Mountains and the Santan Mountains. Most of the land in the study area is composed of desert lowlands. The vacant land in the study area is native desert scrub land. The natural vegetation is characterized by Lower Sonoran Desert Scrub plant community, consisting mainly of creosote bush, desert saltbush, and occasional palo verde, mesquite, or acacia trees.

The existing land uses in the study area are predominantly agricultural and low-density residential. Many dairy farms exist throughout the study area. Medium density and high density residential areas are concentrated in three regions. The residential developments of Sun Lakes and Sunbird that are marketed for retired citizens are located in the southwest corner of the study area. Large residential developments including, Superstition Springs and Sunland Village East are located in the northern part of the study area near the Superstition Freeway. Residential areas are also concentrated in the Town of Queen Creek. Low density residential areas, many with horse privileges, are scattered throughout the study area.

Few large commercial shopping areas exist in the study area. Superstition Springs Mall is located just north of the study area on Power Road. An additional large commercial area is located on the east side of Power Road just south of the Superstition Freeway.

Major industrial land uses include Williams Gateway Airport, General Motors Proving Grounds, TRW Vehicle Safety Systems, Baker Rubber, MGC Pure Chemicals, and Olin Chemicals. The existing land uses, as obtained from field inventory and aerial photographs of the study area, are illustrated in Figure 2-1.

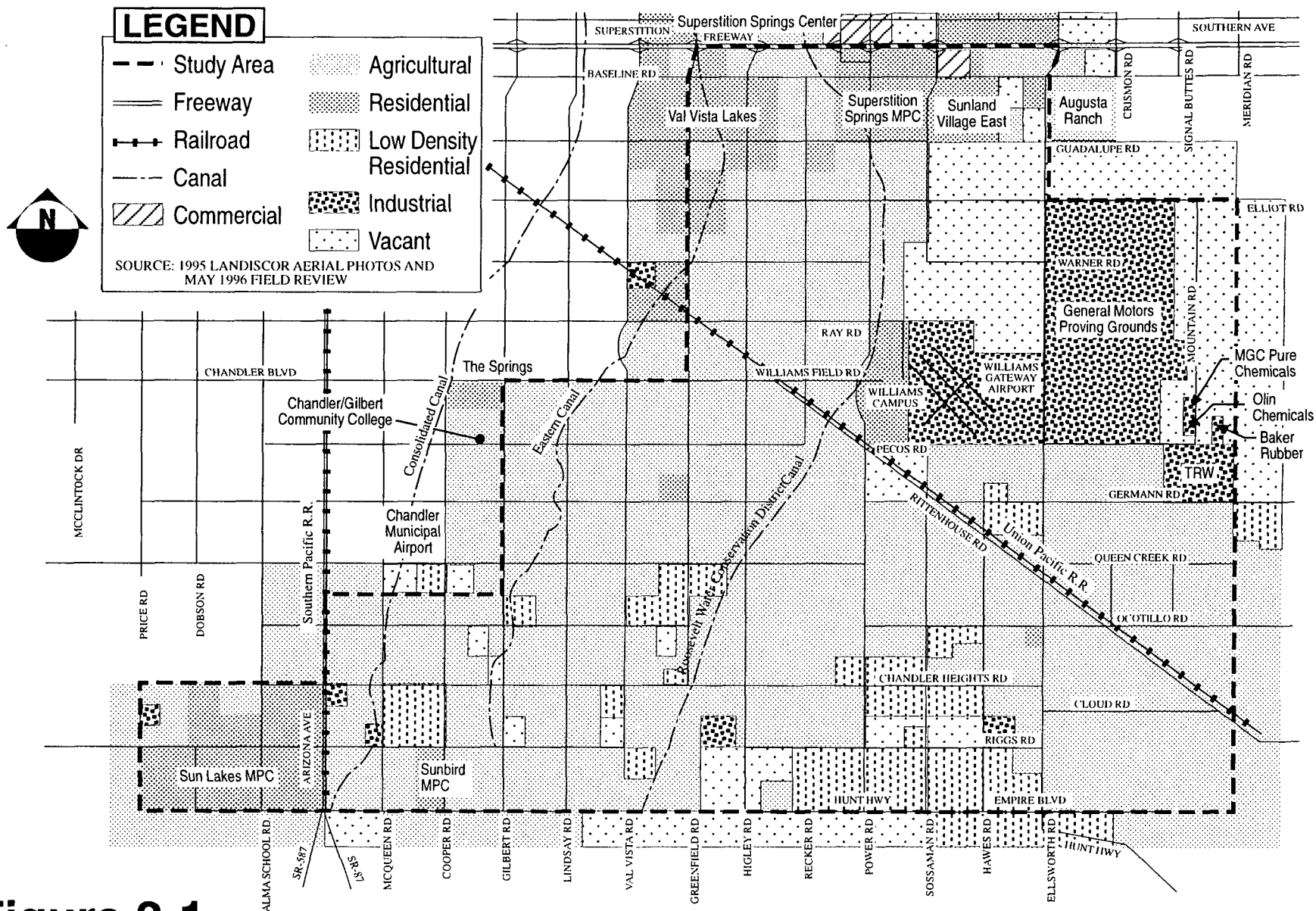


Figure 2-1
Existing Land Uses

Planned Land Developments

Many residential or commercial developments are currently active or are being proposed within the study area. These are summarized in Table 2-1. These projects were identified by staff from jurisdictions involved or by property owners during discussions in May 1996. This data provided input into the socioeconomic projections prepared for the WATP. Figure 2-2 illustrates the location of the developments.

Plans for the Williams Gateway Airport and Williams Campus include further development of the campus to handle the growing student demand in Maricopa County and developing land to accommodate commercial and industrial land uses. The Williams Campus will ultimately provide five million square feet of academic space and serve 20,000 students. One thousand acres of developable land exist at the airport. This land, when built out, will provide ten million square feet of commercial/industrial, and aviation support facilities.

The airport will be used for passenger and cargo flights, and aviation training. The airport master plan forecasts a total of 287,000 operations by the year 2015. The Williams Gateway Airport site also includes a petroleum pipeline feeding two large bulk storage fuel tanks. A major petroleum supplier has expressed interest in using the pipeline connection and fuel storage facilities at the airport to establish a terminal for the distribution of aviation fuels throughout the region.

Hydrology

The land within the study area is generally flat with a slope of less than two percent. Two washes, the Queen Creek Wash and Sanokai Wash drain across the study area. One hundred year flood plains are located on the east side of the canals and the Southern Pacific Railroad tracks. Flood plains also exist around the two washes. The flood plains vary in width between 200 and 1,000 feet. Flood plain locations were obtained from Flood Insurance Rate Maps for Maricopa County dated December 1993 and the Town of Queen Creek General Plan (1990 - 2010). The flood plains in the Queen Creek area are currently being revised by the Maricopa County Flood Control District.

**Table 2-1. Active and Proposed Developments
Williams Gateway Airport Study Area
(as of May 1996)**

Map No.	Development/Subdivision	Location	Status	Acres	Project Description
1	Superstition Springs	Mesa	Active	357	1,558 units; 15 acres commercial (study area)
2	Augusta Ranch	Mesa	Proposed	205	Office/Industrial (study area)
3	Silverado	Gilbert	Active	80	240 single family lots
4	Carol Rae Ranch	Gilbert	Active	160	531 single family lots
5	Circle G Superstition Ranch	Gilbert	Active	40	63 single family lots
6	Sunland Village East	Mesa	Active	564	2,491 units
7	The Highlands	Gilbert	Active	80	302 single family lots
8	Holiday Farms	Gilbert	Active	65	125 single family lots
9	Highland Ranch	Gilbert	Active	30	75 single family lots
10	Hawes and Guadalupe Roads	Mesa	Proposed	228	753 single family lots
11	Greenfield Lakes	Gilbert	Proposed	160	691 single family lots
12	The Crossroads	Gilbert	Proposed	1,791	9,600 units, 9,800 sq. ft. commercial
13	Power Ranch	Gilbert	Proposed	1,800	Master planned, mixed use development
14	Queens Park	Mesa	Active	60	49 single family lots
15	Broadland Ranches Greenfield	Gilbert	Proposed	70	50 single family lots
16	Sossaman Estates	Queen Creek	Proposed	882	550 acres residential, 148 acres commercial/office
17	Heritage Town Center	Queen Creek	Proposed	170	Mixed use plan for the town center area
18	Crismon Ranch	Queen Creek	Proposed	40	19 single family lots
19	Circle G	Queen Creek	Proposed	100	100 single family lots
20	Queen Creek Equestrian	Queen Creek	Proposed	62	125 single family, some commercial
21	Chuparosa	Queen Creek	Active	547	514 single family and condos
22	Sun Lakes	County	Active	3,520	Retirement community, approx. 5,950 units
23	Oakwood	County	Active	160	232 single family lots
24	Circle G at Riggs Homestead	Chandler	Active	80	70 single family lots
25	San Marqui Estates	Queen Creek	Proposed	44	45 single family lots
26	South Creek Ranch	Queen Creek	Proposed	40	24 single family lots
27	Desert Pines	Chandler	Proposed	320	748 single family lots
28	Sunbird	Chandler	Active	320	1,281 units
29	Santan Estates	Queen Creek	Active	20	16 single family lots
30	The Orchards Ranchettes	Queen Creek	Proposed	277	220 single family lots
31	Pegasis	Queen Creek	Proposed	160	80 single family, private airstrip

Source: Various; Applied Economics, 1996.

Notes: Acreages are approximate, as is land use data for proposed developments.

Listings for Superstition Springs and Augusta Ranch include only acreage within the study area.

Some developments not currently annexed into incorporated places.

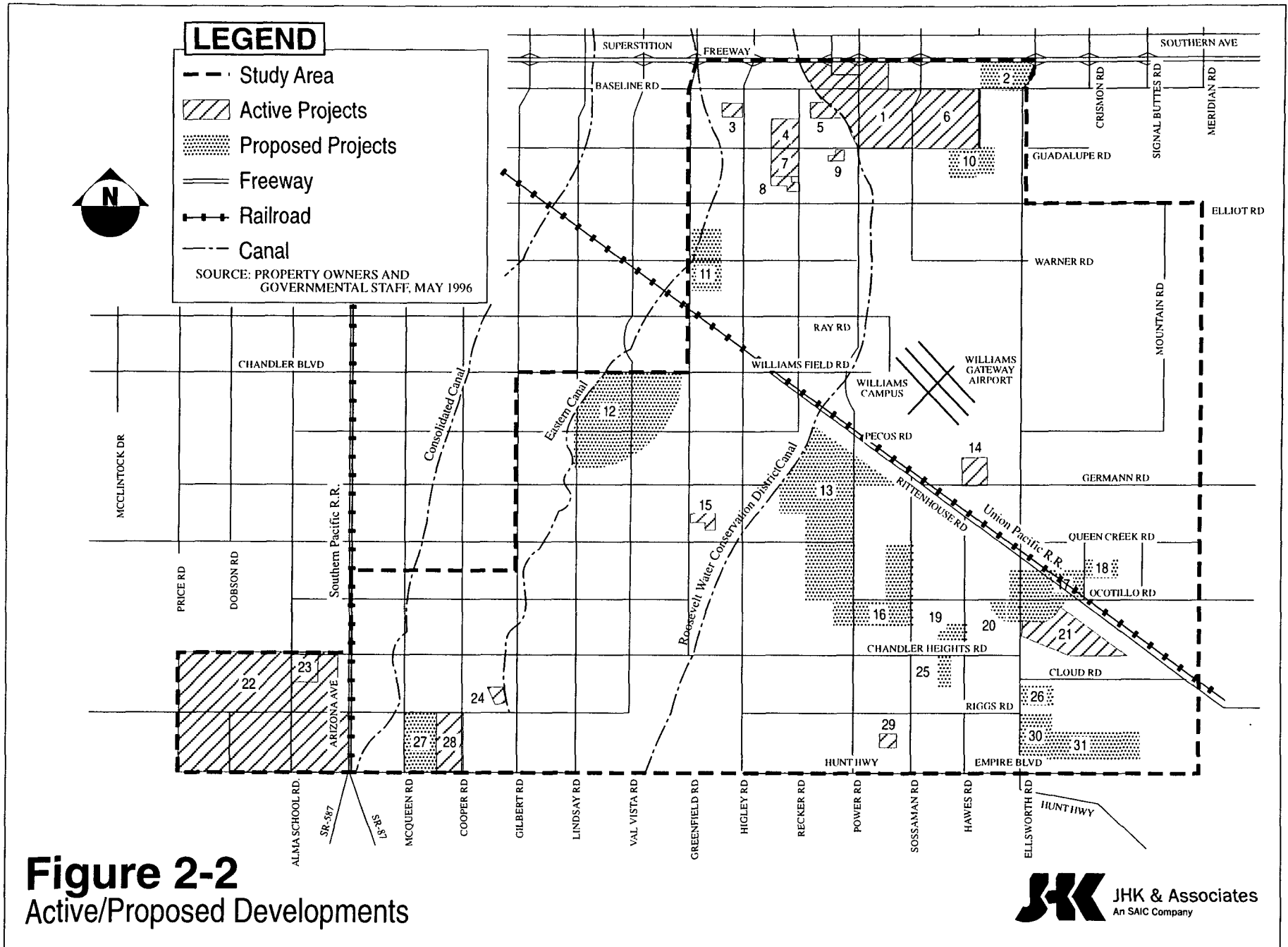


Figure 2-2
Active/Proposed Developments

Three canals carry water south through the study area. They are the Consolidated Canal, the Eastern Canal and the Roosevelt Water Conservation District Canal. Stormwater collection and transport structures in the study area include the Powerline Floodway and the East Maricopa Floodway. The East Maricopa Floodway is approximately 200 feet wide and runs along the east side of the Roosevelt Conservation District Canal. Figure 2-3 illustrates the canals, floodplains, and the drainage structures in the study area.

Three drainage improvement projects that are part of the five year Capital Improvement Program are planned for the study area. They include, the Rittenhouse Drainage Improvement Project, the Ellsworth/Germann Collector Channel, and the Sossaman Channel and Basin.

Historic Structures and Archaeological Sites

The National Register of Historic Places (NRHP) was accessed through the National Park Service's National Register Information System. There were 21 sites listed in the NRHP in the cities of Chandler, Gilbert, and Mesa. Of these, only one is believed to be within the study area, the Midvale Archeological Site, also know as the Williams Air Base Site. Additional archeological sites were mentioned in the Williams Gateway Airport Strategic Economic Development Plan and Industrial/Commercial Master Plan, April 1995 or were provided by the WGA. The archaeological sites within the Williams Area are listed in Table 2-2.

Due to their age (predating 1945), 35 structures on the Williams Gateway Airport and Williams Campus are considered historic. Fourteen of the structures were nominated and submitted to the National Register for Historic Places. Table 2-3 lists the historic structures and their status. The list was obtained from WGA.

Landfills and Hazardous Material Clean Up Sites

Two landfills are located within the study area. The Queen Creek landfill is located on the northeast corner of Riggs Road and Hawes Road and the Chandler landfill is located on the northwest corner of Ocotillo Road and McQueen Road. Landfills in the study area are shown in Figure 2-3.

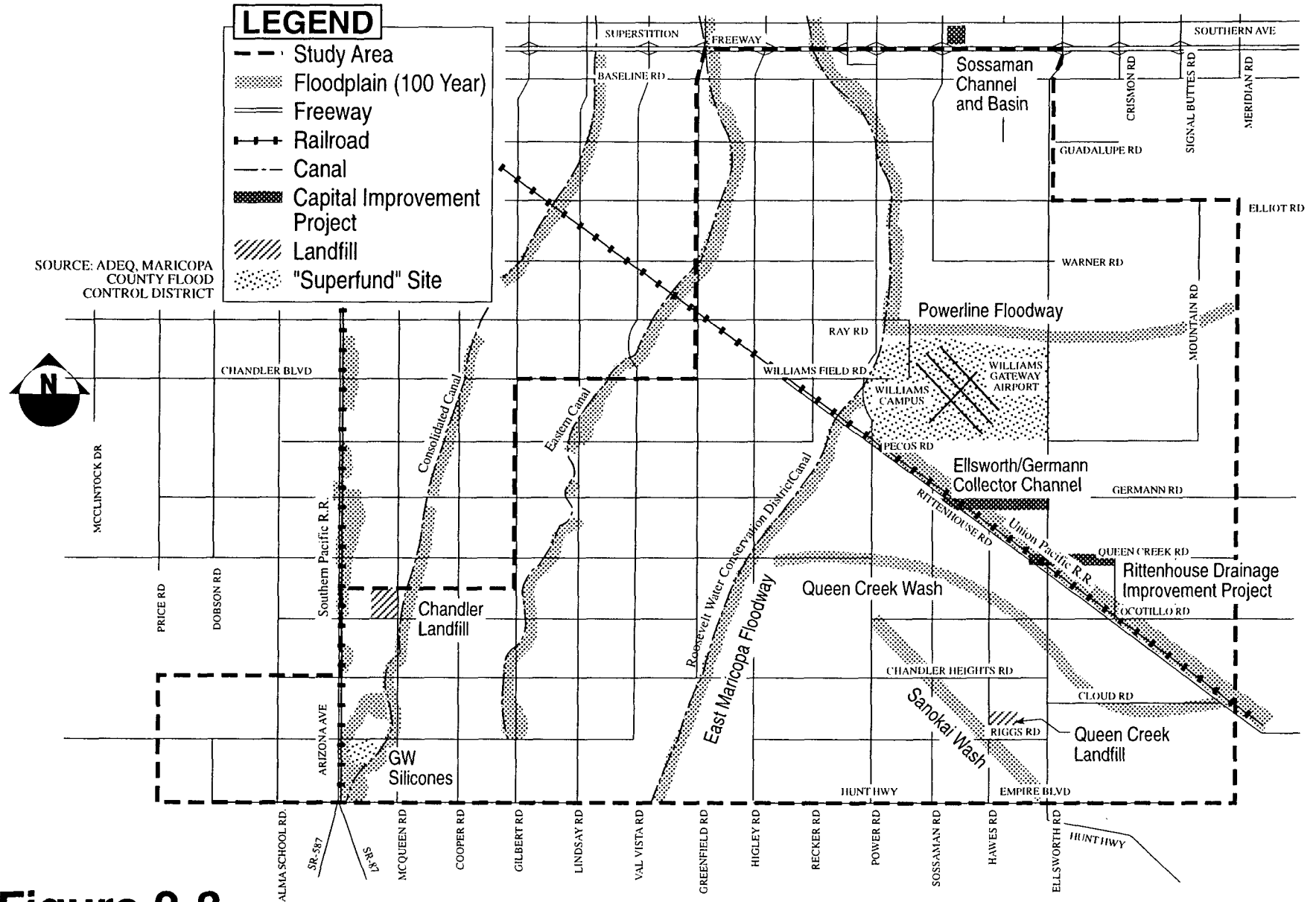


Figure 2-3
Environmental Inventory

Table 2-2. Archeological Sites

Prehistoric Number	Site Name
AZ U:10:24 (ASU)	The Midvale Site*
AZ U:10:20 (ASU)	The Southwestern Germann Site
AZ U:10:25 (ASU)	The Will E Coyote Site
AZ U:10:60 (ASM)	The In-between Site
AZ U:10:61 (ASM)	The Ordnance Site
AZ U:10:65 (ASM)	The Radar Site
AZ U:10:66 (ASM)	El Horno Grande Site
AZ U:10:68 (ASM)	The Outer Limits Site
AZ U:10:62 (ASM)	Not Available
AZ U:10:63 (ASM)	Not Available
AZ U:10:64 (ASM)	Not Available
AZ U:10:67 (ASM)	Not Available
AZ U:10:77 (ASM)	Not Available

*Listed in the National Register of Historic Places.

Table 2-3. Historic Structures

Historic Building Number	Building Name	Status
S-31	Demountable Hangar	Nominated
S-32	Demountable Hangar	Nominated
S-24	Aircraft Maintenance Hangar	Nominated
S-25	Aircraft Maintenance Hangar	Nominated
S-27	Aircraft Maintenance Hangar	Nominated
S-37	Land Plane Hangar	Nominated
S-38	Land Plane Hangar	Nominated
46	Demountable Hangar	On List
100	Flagpole	On List
715	Water Plant and Tower	On List
726	Housing Storage Supply Warehouse	On List
735	C E Maintenance Shop	On List
1007	Original Ammo Bunker	On List
1008	Original Ammo Bunker	On List

The Arizona Department of Environmental Quality (ADEQ) Remedial Projects section was contacted and asked to review enforcement actions in the study area. The G.W. Silicon plant, located near Riggs Road and Arizona Avenue, is a "Superfund", site identified within the study area. ADEQ is currently updating their list of hazardous materials sites. The former Williams Air Force Base is on the National Priority List for "Superfund" sites.

EXISTING TRANSPORTATION SYSTEM

Study Area Roadway Network

A roadway network is designed to provide mobility for vehicles through an area and to provide access to the land uses within the area. Roadways are classified by their primary function. The primary function of a freeway is the mobility of vehicles between business centers and cities within a metropolitan area. Access to the freeways is provided at grade separated traffic interchanges usually limited to a minimum spacing of one mile. The primary function of arterial streets is also mobility. Major arterial streets provide continuity through an urban area and connect major activity centers. Minor arterial streets also provide continuity through an urban area but have a lower traffic demand. Arterial streets in the Phoenix metropolitan area form a one mile grid system throughout the urban area. The major function of collector streets is to collect and distribute local street traffic to and from the arterial streets. Major collectors usually are continuous between arterial streets and are spaced at half mile points. Minor collectors usually intersect arterial streets at the quarter-mile point. The primary function of local streets is to provide access to individual land uses.

The street system in the Williams Area is primarily a square mile grid network of arterial and collector streets. Residential streets are predominately on a grid network with some curvilinear streets. One arterial street, Rittenhouse Road cuts through the study area on a diagonal paralleling the Union Pacific Railroad tracks. The Superstition Freeway (US 60) borders the north side of the study area and is the only freeway currently providing access to the study area. The majority of the arterial streets within the study area are two lane roadways. Santan Boulevard (between Riggs Road and Hunt Highway), Cloud Road (between Chandler Heights Road and Riggs Road), and Mountain Road (between Signal Butte Road alignment and Meridian Road alignment) are collector streets on the half mile

point alignments that currently function as arterial streets. The number of lanes and roadway widths for the existing roadway network is shown in Figure 2-4. Roadway widths were provided by Maricopa County and were not available for all roadways. Unpaved sections of the arterial streets that do not provide travel between adjacent arterials were not illustrated.

Traffic Control

The majority of the arterial streets have posted speed limits of 45 or 50 miles per hour. A few of the streets have sections posted 55 miles per hour. Speed limits are reduced through many of the residential areas. Most of the intersections are two-way or four-way stop controlled. Some of the intersections on Baseline Road, Guadalupe Road, Williams Field Road, Riggs Road, Power Road and Arizona Avenue are controlled by traffic signals. All the ramp intersections at the Superstition Freeway are also controlled by traffic signals. Figure 2-5 illustrates the posted speed limits of the roadways and the traffic control at the intersections in the study area. Traffic control and speed limits in the study area were obtained from field review.

Traffic Volumes

Average daily traffic volumes for 1995 were obtained from the Maricopa Association of Governments' Average Weekday Traffic Map published in February 1996. Traffic volumes from the 1996 City of Mesa Traffic Volume Map and the 1995 Town of Gilbert Traffic Count Study were reviewed to confirm counts in the study area. The traffic volumes for the roadway network are shown in Figure 2-6.

Level of Service

Operating Level of Service (LOS) standards were developed to evaluate the transportation network in the Williams Area. LOS D or better is the acceptable operating LOS for arterial streets in urban areas. Table 2-4 summarizes the LOS thresholds used to evaluate both arterial streets and freeways.

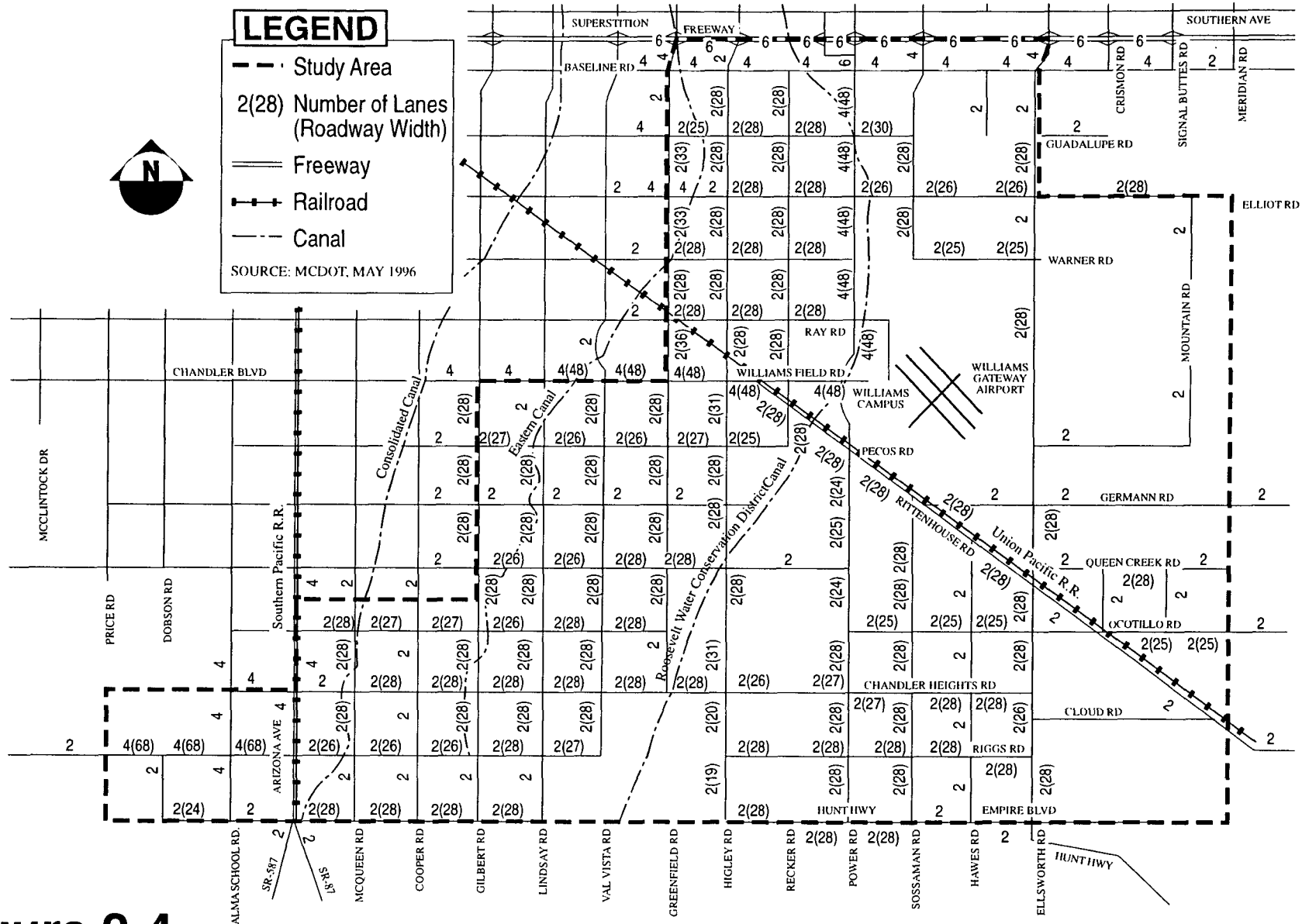


Figure 2-4
Existing Arterial Street Network - Number of Lanes and Roadway Width



LEGEND

- Study Area
- Freeway
- Railroad
- Canal
- Traffic Signal
- Stop Sign
- 55 Speed Limit

SOURCE: FIELD REVIEW, MAY 1996

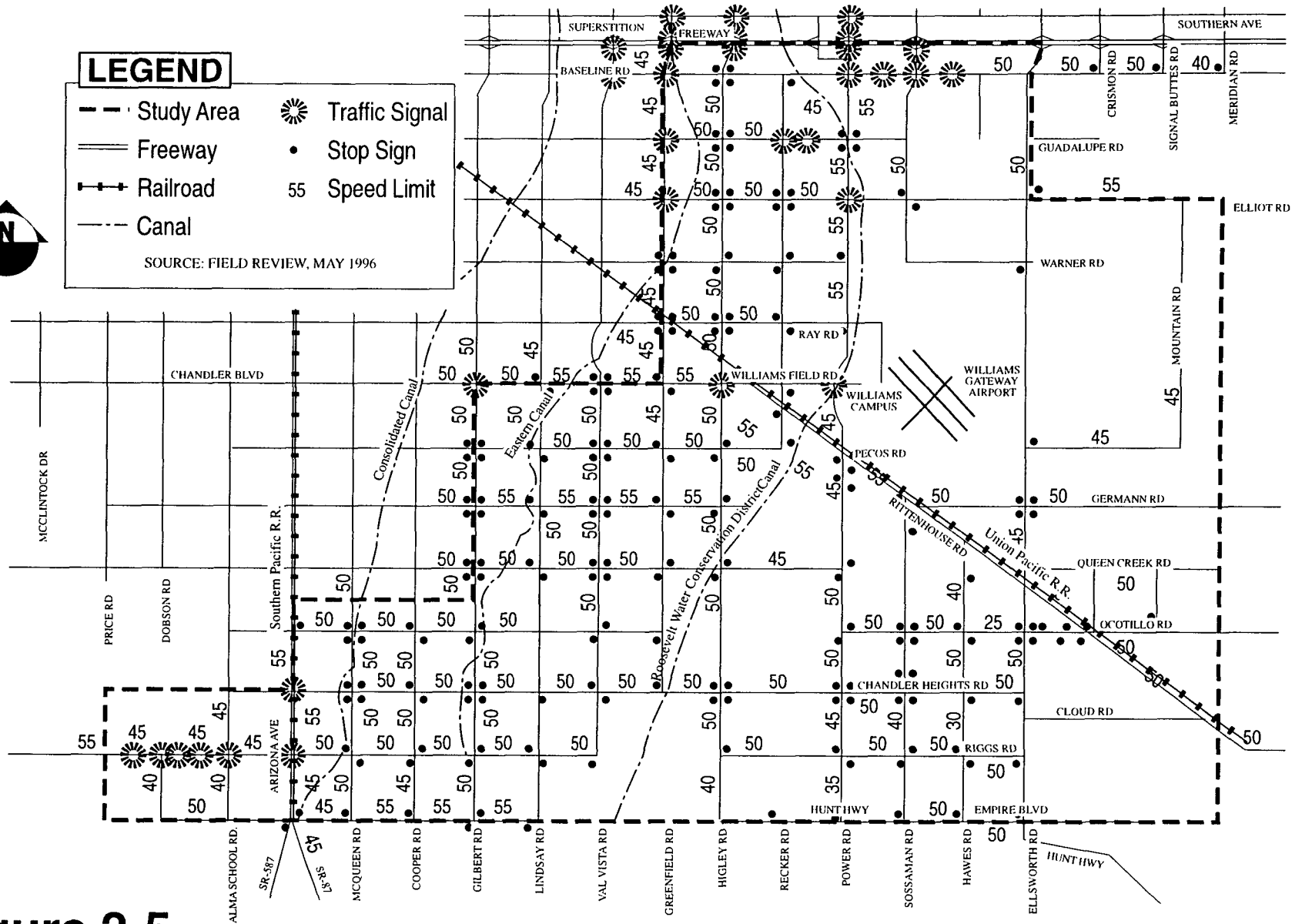


Figure 2-5
Traffic Control

SOURCE: MAG AVERAGE
WEEKDAY
TRAFFIC MAP,
FEB 1996 AND
CITY OF MESA
1996 TRAFFIC
VOLUME MAP

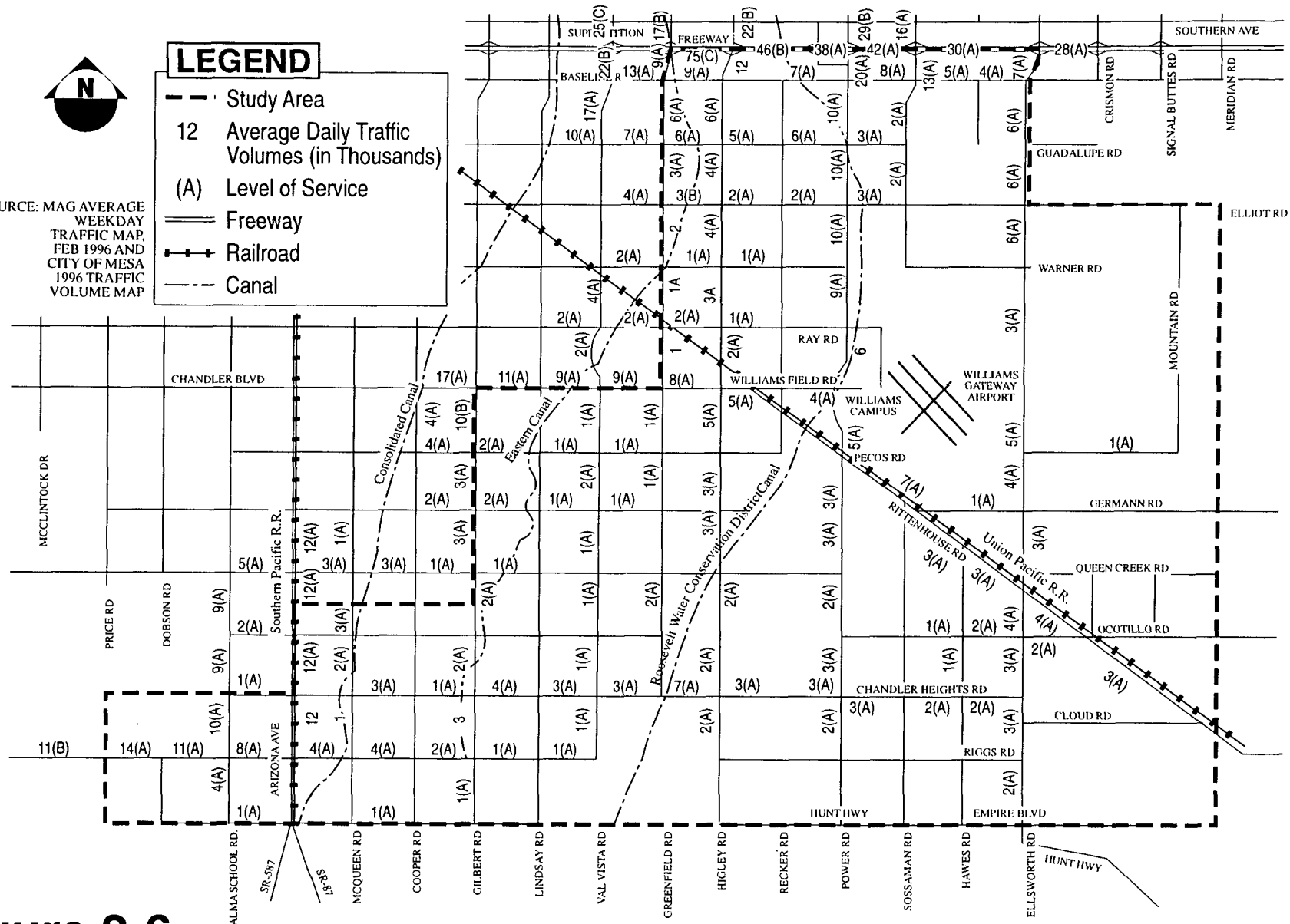


Figure 2-6
Year 1995 Average Daily Traffic Volumes and Level of Service

Table 2-4. LOS Guidelines for Average Daily Traffic Volumes

Roadway	Level of Service*				
	A	B	C	D	E
Arterial Streets					
2 lanes	8,000	11,000	14,000	16,000	17,000
4 lanes	17,000	24,000	27,000	32,000	33,000
6 lanes	26,000	37,000	42,000	48,000	51,000
Freeways					
4 lanes	29,000	46,000	69,000	87,000	98,000
6 lanes	43,000	69,000	103,000	130,000	153,000
8 lanes	58,000	92,000	138,000	174,000	204,000

* The traffic volumes shown under each LOS is the upper threshold volume providing that LOS.

The LOS threshold volumes for arterial streets used were based on MAG's thresholds for LOS D assuming a K-factor (the percentage of average daily traffic occurring during the peak hour) of 9 percent. Other LOS threshold volumes were determined using Highway Capacity Software (HCS) which is based on procedures from the *1994 Highway Capacity Manual* (HCM).

Assumptions include:

- A 45 mph free flow speed.
- Two to three traffic signals per mile.
- An effective g/c ratio of 0.45.
- A 90 second cycle length.
- A divided roadway with either a median or a two-way left turn lane for four and six lane arterial streets.

The LOS threshold volumes for freeways were based on converting peak hour service flow rates in Table 2-5 to average daily traffic volumes assuming a K-factor of 9 percent and a free flow speed of 65 mph. The peak hour service flow rates were obtained from the *1994 Highway Capacity Manual*. Table 2-4 can be applied to the study area arterial roadway network for a level of service estimate of current traffic conditions. Figure 2-6 illustrates the level of service for the roadways in the study area. All the roadways in the study area operate at LOS A or B with the exception of portions of the Superstition Freeway which operate at LOS C.

**Table 2-5. Maximum Service Flow Rates for Freeways
(65 MPH Free Flow Speed)**

LOS	Maximum Service Flow Rate (pcphpl)*	
	4 Lane Freeways	6 or 8 Lane Freeways
A	650	650
B	1,040	1,040
C	1,548	1,548
D	1,952	1,952
E	2,200	2,300

*pcphpl = passenger cars per hour per lane.

Accidents

Between 1989 and 1991, MCDOT converted 10 unsignalized intersections from two-way stop control to four-way stop control due to a large number of accidents at these intersections. Five of the intersections were in the Williams Area. Between three and five accidents per year occurred at these intersections before the installation of four-way stop control. JHK & Associates conducted a before and after accident analysis of the intersections. Three years of accident data before the conversion to four-way stop control and three years of accident data after were analyzed. A summary of the analysis is shown in Table 2-6.

Table 2-6. Before and After Analysis of Accidents

Intersection	Total Accidents			Angle Accidents		
	Accident Rates*		Percent Reduction	Accident Rates*		Percent Reduction
	Before	After		Before	After	
Warner Road and Greenfield Road	9.80	0.00	100%	9.80	0.00	100%
Germann Road and Gilbert Road	2.46	0.38	85%	2.05	0.19	91%
Pecos Road and Gilbert Road	2.21	0.11	95%	2.21	0.11	95%
Williams Field Road and Val Vista Drive	1.56	0.54	65%	1.17	0.54	54%
Ray Road and Higley Road	2.66	0.00	100%	2.22	0.00	100%

* Rates are in units of accidents per million vehicles.

The before and after accident analysis indicates that the conversion of two-way stop-control to four-way stop-control when warranted because of the number of accidents reduces the number of total accidents and angle accidents. The *Manual of Uniform Traffic Control Devices* (MUTCD) 1988 Edition states on page 2B-3 that multi-way stop sign installation should be considered if the following warrant is met:

An accident problem, as indicated by five or more reported accidents of a type susceptible of correction by a multi-way stop installation in a 12-month period. Such accidents include right- and left-turn collisions as well as right-angle collisions.

At all of the intersections studied, the accident rate decreased for both overall and angle accidents. In fact, half of the intersections experienced zero accidents during the three year period after the installation of four-way stop-control. Therefore, if any of the two-way stop controlled intersections in the Williams Area experience five or more accidents in a year, four way stop control should be considered until traffic volumes warrant a traffic signal.

The intersection of Power Road and Williams Field Road is at the current entrance to the Williams Campus and Williams Gateway Airport. The intersection is signalized. In July of 1990, the permissive left turn phasing was replaced with protected/permissive left turn signal phasing. Three years of accident data following the change in phasing record a total of eight accidents at the intersection with the majority being caused by left turning vehicles refusing to yield the right-of-way. The eight accidents are a sharp decline from the 25 accidents that occurred in the three years before the change in left turn phasing. During the period from 1994 to 1996, 11 accidents occurred at this intersection with eight accidents caused by left turn vehicles refusing to yield the right-of-way and three accidents by vehicles running a red light.

AIR QUALITY

Based on discussions with MAG staff, there are no known air quality violations within the study area. However, PM10 (particulate) violations have occurred in nearby Chandler. These violations are largely contributed to the construction business and farmers plowing fields, not to traffic.

EXISTING TRANSIT SERVICE

Limited transit services are available within the study area. Bus service and bicycle facilities exist just inside the area and a Union Pacific rail line traverses the area. The existing transit services are illustrated in Figure 2-7. Existing transit services include those operated through Valley Metro, Mesa-Chandler-Gilbert Dial-a-Ride, and ASU East Campus. Exact route locations and route numbers shown in Figure 2-7 could change at any time.

The Williams Gateway Airport and Williams Campus are within the city limits of Mesa, and as such local general public transit services would be the responsibility of the City of Mesa. Regional services are within the purview of RPTA.

Bus and Shuttle Services

Dial-a-ride services (started in July 1996) are being provided by the Mesa-Chandler-Gilbert Dial-a-Ride to the areas of Mesa, Chandler, and Gilbert within the study area and north of Pecos Road. This service is available to persons who are elderly or have a disability. Currently dial-a-ride service is not available in Queen Creek or south of Pecos Road.

Fixed-route bus services operate to Superstition Springs Mall. The mall serves as a transfer center for Route 30: University Drive, and Route 46: Broadway and Route 184: Power. Route 30 operates on University Drive between Dobson Road (originating at the Tri-City Mall) and Power Road. At Power Road the route travels north to the East Mesa Senior Center and then back south to the Superstition Springs Mall. Service operates hourly from 5:00 a.m. until 6:30 p.m. Route 46 also operates between Dobson Road and Power Road, deviating to serve the Mesa Senior Center. At Power Road, Route 184 travels south and terminates along Baseline Road at Sunland Village East.

Additional service, Route 156, operates on Chandler Boulevard between Rural Road and Gilbert Road. At Gilbert Road it travels south to Pecos Road to serve Chandler-Gilbert Community College. This service operates hourly from 5:45 a.m. to 5:45 p.m. Chandler-Gilbert Community College is approximately eight miles from the Williams Campus.

ASU East began operating shuttle services between the main and east campuses in August 1996. Service is operated throughout the day during the academic year. This service

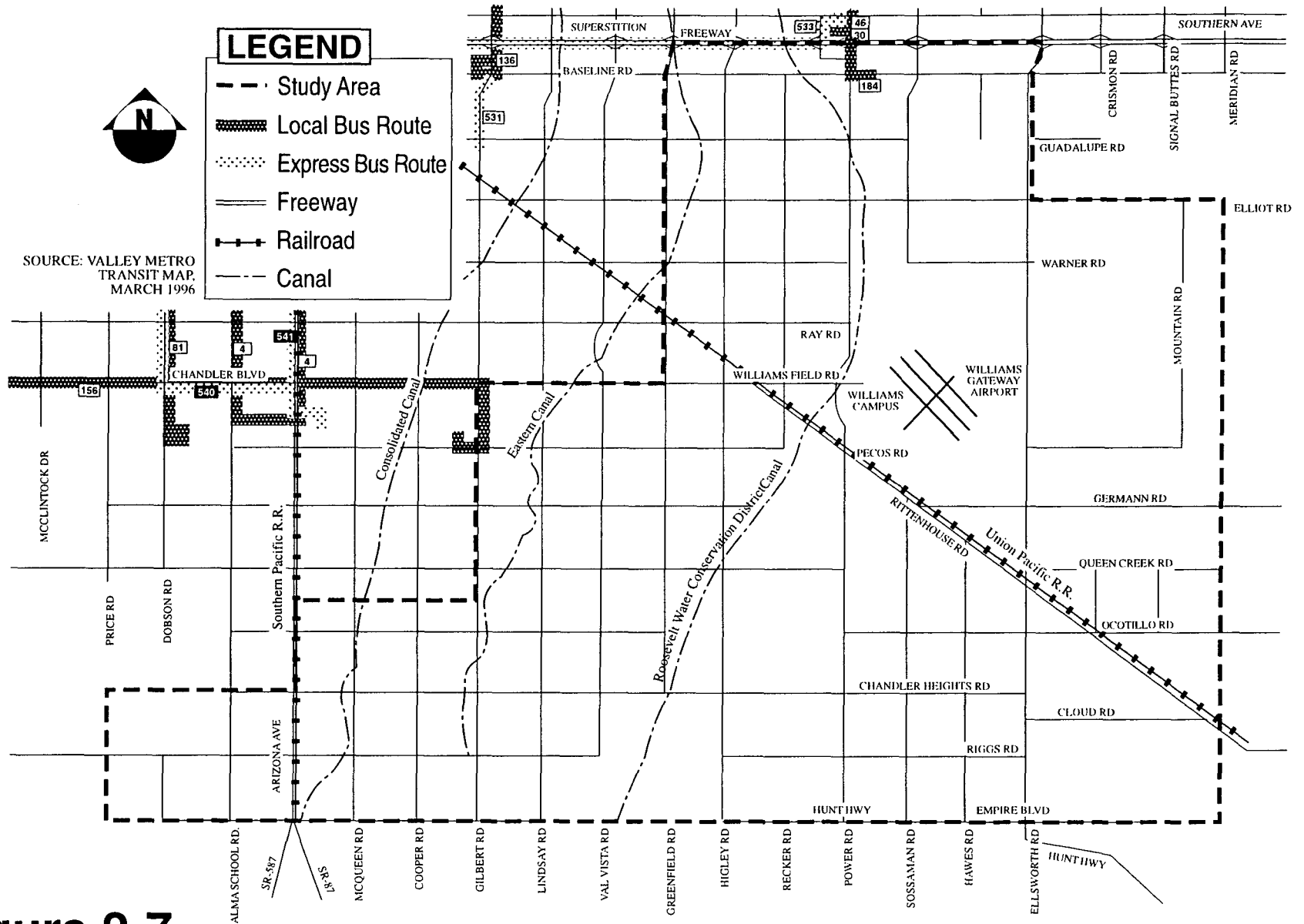


Figure 2-7
Local/Express Bus Routes

is oriented to students, faculty, staff, and others affiliated with the campus. A \$2.50 fare per trip is charged for the service.

Funding for the ASU East shuttle service is anticipated through a combination of fares, general operating funds, travel reduction funds, and possibly community college funds. ASU has also considered providing shuttle service to Chandler-Gilbert Community College and north to Superstition Springs Mall to connect to Valley Metro service. These connections would enable a much higher number of students to access the campus by bus. However, the funding is not presently available to operate such services.

No facilities for buses are provided within the study area. Roadways generally have one lane in each direction and do not have areas for bus pullouts and passenger loading. While this is appropriate at the current stage of development, it may be necessary to provide additional facilities at build-out.

Rail Line

A rail line next to Rittenhouse Road passes through the study area and is adjacent to the Williams Gateway Airport and Williams Campus property at the southwest corner. It is owned by Union Pacific and is part of the spur which comes off the main line in Picacho to serve the Phoenix area. The portion in the study area travels at a diagonal along Rittenhouse Road, continuing through Gilbert, and connects to a north-south track at Baseline Road. The spur is part of a loop which continues west parallel to Buckeye Road and the Buckeye Canal past the Palo Verde Nuclear Generating Station, then southwest to Wellton where it reconnects with the main line 25 miles east of Yuma. Union Pacific has recently served notice that the portion of the line west of metropolitan Phoenix will no longer be maintained.

Because of Union Pacific's intent to discontinue the use of the western portion of this loop, AMTRAK stopped operating passenger service on the line effective June 1, 1996. Passengers now travel by bus to Tucson to board AMTRAK service. Union Pacific trains will now return to the main line in Picacho after serving Phoenix rather than making a one-way loop through Phoenix. It is estimated that approximately three trains per day use this track. Previous plans for the Williams Gateway Airport/Williams Campus show rail service on site, however Williams Gateway Airport has not received any interest from tenants which

need rail service. Therefore, the need for a rail connection to Williams Gateway Airport is unknown at this time.

Light rail service to the study area, especially the Williams Campus, is being discussed as a means of improving mobility in the area. The Maricopa Association of Governments (MAG) is currently conducting a fixed guideway system study to determine the feasibility of light rail corridors in the Phoenix metropolitan area. At this time, however, there are no formal plans to serve the study area with light rail transit.

Trails and Bicycle Facilities

Currently no improved or dedicated trails or bicycle facilities exist within the study area. However, bicycle facilities exist just outside the study area. Both the Town of Gilbert and Town of Queen Creek have open space trail plans as part of their general plans. These plans establish a system of trails which will serve as a recreational amenity and an alternative transportation network that accommodates pedestrian, bicycle, and equestrian uses. The City of Mesa has a draft parks and open space plan suggesting potential bicycle facilities. Existing bicycle facilities were identified from MAG's Bikeway Map. Figure 2-8 illustrates the existing and proposed trails and bicycle facilities. Additional bicycle facilities will be created if bicycle lanes are included with new roadway construction.

LONG RANGE ROADWAY PLAN

The current roadway plan for the study area as shown in Figure 2-9 is a collection of the circulation plans from the General Plans of the jurisdictions that fall inside the study area. To compile this map, the following documents were reviewed: Chandler Transportation Plan Update, May 1993; Chandler Policies and Guidelines for Street Design and Access Control, May 1993; Town of Gilbert General Plan Update, May 1994; Town of Gilbert Public Works Procedure Manual, August 1995; Town of Queen Creek General Plan, October 1996; Red Mountain and Santan Corridors Major Investment Study, May 1996 (Draft); Hunt Highway Corridor Assessment Report, October 1995; City of Mesa General Plan, March 1996. Table 2-7 summarizes the right of way requirements, number of lanes, and access points and signal spacing for each roadway classification for each jurisdiction in the study area.

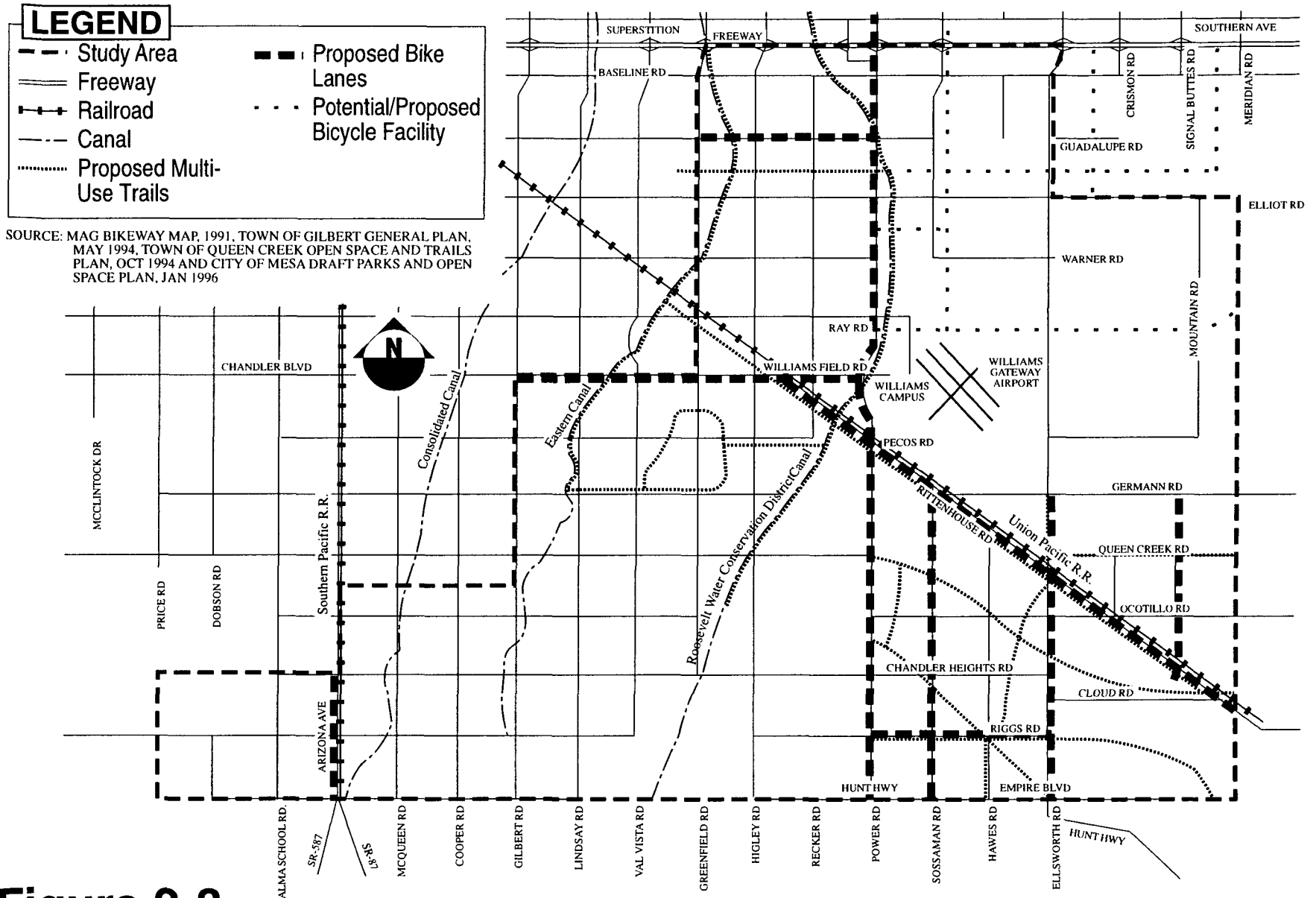


Figure 2-8
Bicycle and Trails Map (Local Jurisdictions Plans)

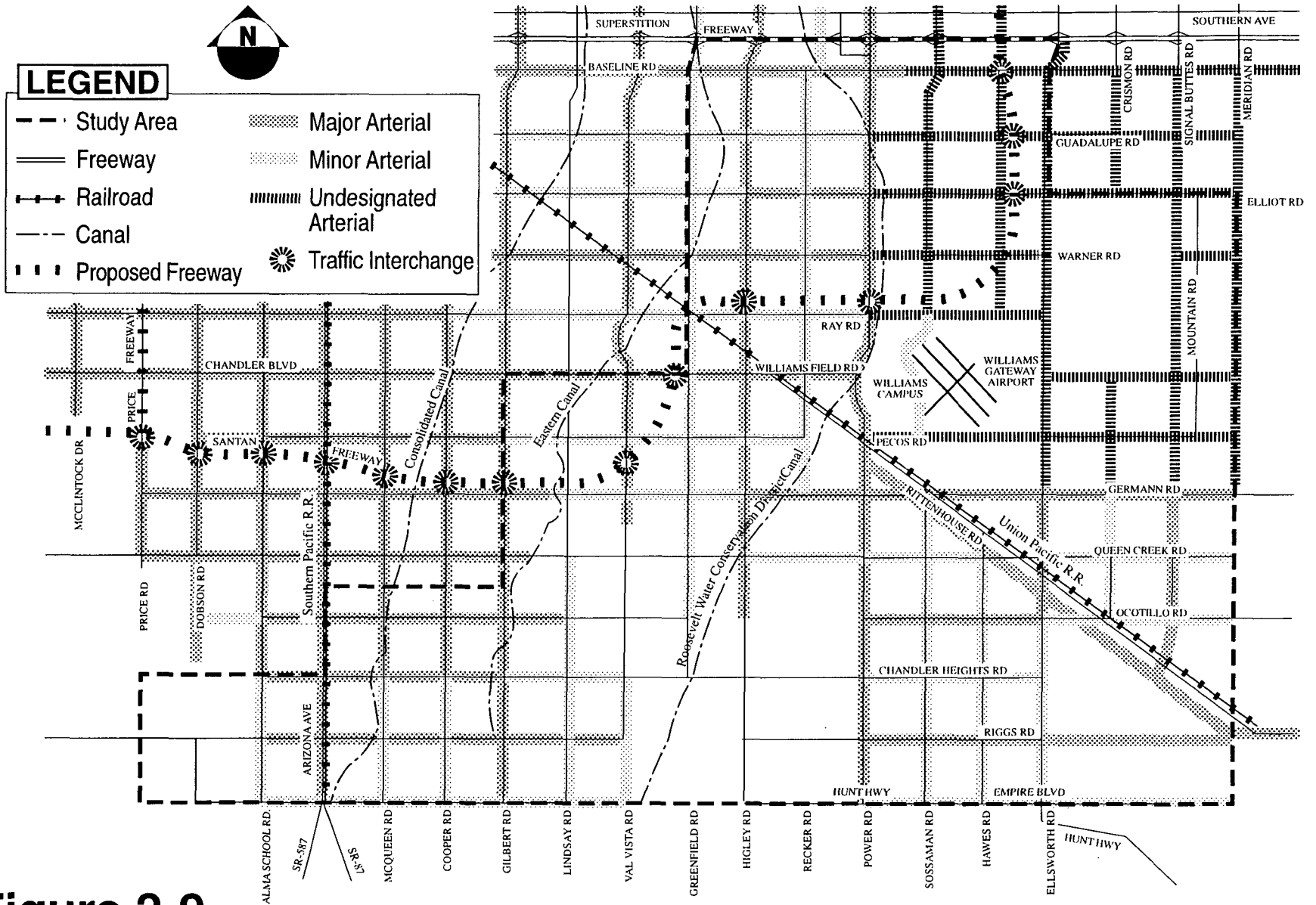


Figure 2-9
Current Roadway Plans

Table 2-7. Roadway Guidelines

	Chandler	Gilbert	Mesa	Maricopa County	Queen Creek
MAJOR ARTERIAL					
Number of Lanes	6	6	6	4-6	6
Right-of-Way	130 feet	130 feet	130 feet	130 feet	130 feet
Median Type	Raised	Raised	Varies	Raised	Raised
MINOR ARTERIAL					
Number of Lanes	4	4	4	4	4
Right-of-Way	110 feet	130 feet	130 feet	110 feet	110 feet
Median Type	Raised	Striped	Striped	Striped	Raised
MINOR AND MAJOR ARTERIAL					
Median Break	Full ¹	660 feet	660 feet	660 feet	
Spacing	Partial ¹		330 feet	330 feet	
Access Point Spacing ¹		100 feet	220 feet	60 feet	105 feet
Signal Spacing ¹		1/4 mile	1/4 mile	1/4 mile	
Bicycle Lane Width		6 feet	5.5 feet	5.5 feet	5 feet
					4 feet ²

1 Minimum spacing.

2 From edge of gutter.

The City of Mesa and the Town of Gilbert have designated Power Road as a principal arterial between Pecos Road and the Superstition Freeway. The City of Mesa will annex Power Road in the future. Power Road will have access limited to a minimum quarter-mile spacing. A 150 foot right-of-way will be reserved a quarter mile north and south of each major cross street.

In addition to the roadway guidelines shown in Table 2-7, the City of Mesa is planning for Baseline Road, Power Road, Ellsworth Road, and sections of Elliot Road, Warner Road and Guadalupe Road to have raised medians. The City of Mesa also requires that all arterial streets within a half mile of a freeway interchange have a raised median. Both the City of Chandler and the City of Mesa require dual left turns, three through lanes, and an exclusive right-turn lane for all approaches of intersections of two major arterial streets.

Santan Freeway

The Santan Freeway included in the long range transportation plan for the Phoenix metropolitan area is planned as a freeway extending 24 miles from Interstate 10 in the west to the Superstition Freeway (US 60) in the east. The freeway will also connect to the Price Freeway. Based on the October, 1996 draft MAG Freeway/Expressway Plan, the Santan Freeway will be completed by the year 2012. The portion of the Santan Freeway from Interstate 10 to the Arizona Avenue is expected to be opened by 2005. The remaining sections of the Santan Freeway are scheduled to be completed between 2008 and 2012. The freeway is scheduled to be constructed in sections starting in both directions, at the Price Freeway and at US 60 and moving towards Williams Gateway Airport and Williams Campus. The Santan Freeway when completed will be a four lane freeway through the study area and provide access to the Williams Gateway Airport and Williams Campus. Traffic interchanges within the study area are planned at Val Vista Drive, Williams Field Road, Higley Road, Power Road, Elliot Road, Guadalupe Road, and Baseline Road. Williams Gateway Airport supports an additional traffic interchange at Hawes Road. This issue is addressed in Chapter 5.

The Queen Creek General Plan mentions that the Pinal County Comprehensive Plan includes a long range goal of providing a connection to the Santan Freeway along the Germann Road alignment to US 60 near Florence Junction.

Hunt Highway

The Hunt Highway Corridor Study recommends that Hunt Highway become a two lane paved roadway between Ellsworth Road and Attaway Road in Pinal County. The study also recommends that a 260 foot right-of-way be reserved for the portion of Hunt Highway in Pinal County to allow for future widening to a four lane divided highway. The Pinal County Five Year Transportation Plan (FY1996 to FY2000) has funds programmed for roadway construction on Hunt Highway between Gary Road and Arizona Farms Road. The improvement of Hunt Highway and the development of Johnson Ranch adjacent to Hunt Highway will affect the traffic on Ellsworth Road. This issue is also addressed in Chapter 5.

Roads of Regional Significance

The Maricopa Association of Governments has identified a system of roadways spaced at two to three mile intervals that carry significant regional traffic. As proposed, these roadways will have three lanes in each direction of travel separated by a median. Traffic signals will be limited to mile and half-mile locations and left and right turn lanes will be provided where turns are permitted. Bicycle lanes will be included, as will pedestrian paths or sidewalks and landscaping. Pullouts will be provided for buses. The roadways will be constructed on 140 feet of right-of-way. The Roads of Regional Significance in the study area are Gilbert Road, Higley Road, Riggs Road, and portions of Ellsworth Road, Warner Road, Germann Road, and Queen Creek Road. These Roads of Regional Significance are illustrated in Figure 2-10. The Roads of Regional Significance is at this time only a concept and not a part of the adopted Long Range Transportation Plan because of a lack of funding. As part of the Williams Area Transportation Plan study, key roads in the study area have been identified. These are presented in Chapter 5.

PLANNED OR PROGRAMMED PROJECTS

The 1996-2000 MAG Transportation Improvement Program and the Maricopa County Five Year Capital Improvements Program were reviewed to identify recently completed or programmed roadway projects in or near the study area. Table 2-8 summarizes the recently completed roadway projects. Table 2-9 summarizes the roadway projects that are programmed through year 2000 and Figure 2-11 illustrates the location of the programmed projects. Many of the 1996 scheduled projects are under construction.

Table 2-8. Recently Completed Roadway Projects

Roadway	Project Area	Type of Work
Dobson Road	Queen Creek Road to 0.5 mile North	Widen from 4 to 6 lanes
Commerce Drive	Queen Creek Road to Ocotillo Road	Construct 4 lanes
Germann Road	Arizona Avenue to Airport Boulevard.	Widen from 2 to 4 lanes
McQueen Road	Chandler Boulevard to Pecos Road	Widen from 2 to 4 lanes
Queen Creek Road	Price Road to Alma School Road	Widen from 2 to 4 lanes

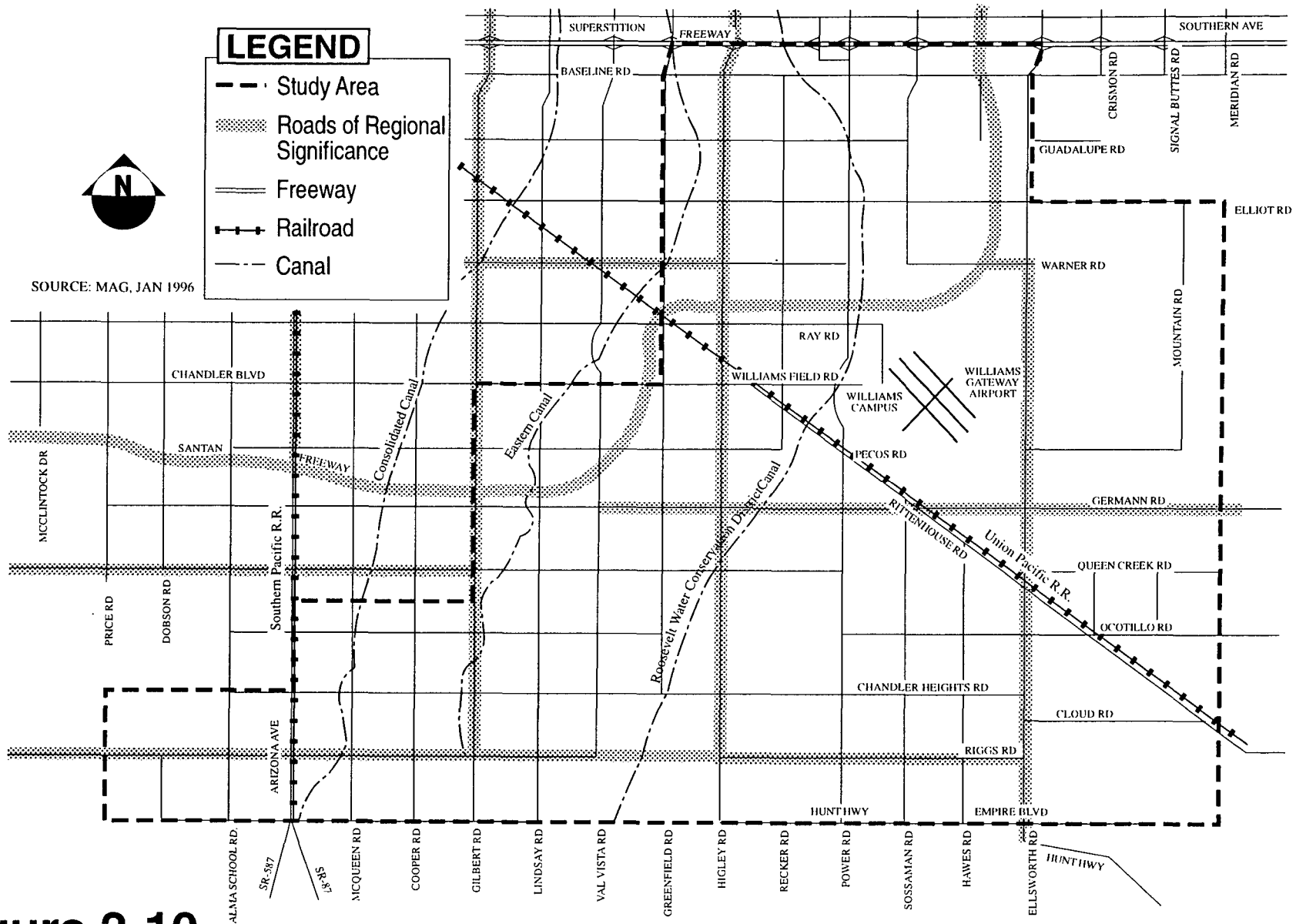


Figure 2-10
MAG Roads of Regional Significance

Table 2-9. Programmed Roadway Improvements

Fiscal Year	Agency	Location	Type of Work	Miles	Lanes Before	Lanes After	Funds	Cost
1996	Chandler	Arizona Ave: Pecos Rd to Ocotillo Rd	Reconstruct to 6 lanes	3.00	4	6	State	7,000,000
1996	Chandler	Chandler Blvd: McQueen Rd to Gilbert Rd	Reconstruct to add a third westbound lane	2.00	4	5	Private	660,000
1996	Chandler	Germann Rd: Airport Blvd to Gilbert Rd	Reconstruct to 4 lanes	1.50	2	4	Private	2,000,000
1996	Chandler	Gilbert Rd: Germann Rd to Queen Creek Rd	Reconstruct to 4 lanes	1.00	2	4	Private	1,650,000
1996	Chandler	Pecos Rd: Gilbert Rd to Cooper Rd	Reconstruct to 4 lanes	1.00	2	4	Private	1,650,000
1996	Chandler	Riggs Rd: McQueen Rd to 1/2 Mile East	Reconstruct to 4 lanes	0.50	2	4	Private	330,000
1996	Gilbert	Greenfield Rd: Knox St to Warner Rd	Reconstruct roadway to 68 ft cross section	0.50	2	4	Private	750,000
1996	Gilbert	Greenfield Rd: Warner Rd to Elliot Rd	Reconstruct roadway to 68 ft cross section	1.00	2	4	Private	1,200,000
1996	Gilbert	Recker Rd: Houston Ave to Guadalupe Rd	Reconstruct roadway to 68 ft cross section	0.50	2	4	Private	400,000
1996	Gilbert	Recker Rd: Guadalupe Rd to Elliot Rd	Reconstruct 1/2 width to 68 ft cross section	1.00	2	2	Private	700,000
1996	Maricopa County	Ellsworth Rd: Queen Creek Wash North of Chandler Hts Rd	Reconstruct bridge	0.10	2	2	Local	650,000
1996	Maricopa County	Lindsay Rd: Germann Rd to Williams Field Rd	Construct 2 lanes and bridge	2.00	0	2	Local	1,250,000
1996	Mesa	Sossaman Rd: Guadalupe Rd to Monterey Ave	Widen road, add 2 lanes	0.25	2	4	Private	150,000
1996	Mesa	Sossaman Rd: Superstition Springs Blvd to Baseline Rd	Widen road, add 1 lane	0.25	4	5	Private	150,000
1997	Chandler	Dobson Rd: Chandler Heights Rd to 1/2 mile North	Construct 4 lane roadway	0.50	0	4	Private	1,320,000
1997	Gilbert	Guadalupe Rd: 172nd St to Recker Rd	Reconstruct 1/2 width to 68 ft cross section	0.50	2	2	Private	600,000
1997	Gilbert	Guadalupe Rd: SRP Eastern Canal to Higley Rd	Reconstruct 1/2 width to 68 ft cross section	0.75	2	4	Local	1,000,000
1997	Gilbert	Warner Rd: Greenfield Rd to Val Vista Rd	Reconstruct 1/2 width to 94 ft cross section	1.00	2	4	Local	750,000
1997	Maricopa County	Germann Rd: Eastern Canal West of Lindsay Rd	Bridge Reconstruction	0.10	2	2	Local	250,000
1997	Mesa	Power Rd: Kiowa Ave to Guadalupe Rd	Widen road, add 1 lane	0.75	4	5	Private	450,000
1997	Mesa	Sossaman Rd: Southern Ave to US 60	Widen road, add 1 lane	0.50	4	5	Private	300,000
1997	Mesa	Guadalupe Rd: Power Rd to Sossaman Rd	Widen road, add 1 lane	1.00	2	3	Private	600,000
1997	Mesa	Hawes Rd: Medina Ave to Guadalupe Rd	Widen road, add left turn lane	0.50	2	2	Private	300,000

Table 2-9. Programmed Roadway Improvements (Continued)

Fiscal Year	Agency	Location	Type of Work	Miles	Lanes Before	Lanes After	Funds	Cost
1998	Gilbert	Elliot Rd: 156th St to 164th St	Reconstruct 1/2 width to 68 ft cross section	1.00	2	4	Private	1,000,000
1998	Maricopa County	Higley Rd: at Queen Creek Wash	Reconstruct Bridge	0.25	2	2	Local	900,000
1998	Maricopa County	Ocotillo Rd: Queen Creek Wash to East of Hawes Rd	Bridge reconstruction	0.10	2	2	Local	1,200,000
1998	Maricopa County	Riggs Rd: Val Vista Dr to Higley Rd	Construct 2 lanes and bridge	2.00	0	2	Local	2,600,000
1998	Mesa	Baseline Rd: Hawes Rd to Ellsworth Rd	Widen road, add 1 lane	1.00	4	5	Private	600,000
1998	Mesa	Ellsworth Rd: US 60 to Baseline Rd	Widen road, add 2 lanes	0.50	4	6	Private	300,000
1998	Mesa	Guadalupe Rd: Ellsworth Rd to Crismon Rd	New 2 lane road	1.00	0	2	Private	600,000
1998	Mesa	Guadalupe Rd: Hawes Rd to Ellsworth Rd	New 2 lane road	1.00	0	2	Private	600,000
1998	Mesa	Guadalupe Rd: Sossaman Rd to Hawes Rd	New 2 lane road	1.00	0	2	Private	600,000
1999	Gilbert	Greenfield Rd: Guadalupe Rd to Elliott Rd.	Reconstruct 1/2 width to 68 ft cross section	1.00	2	4	Private	1,000,000
1999	Maricopa County	Power Rd (II): RWCD Canal South of Williams Field Rd to 0.1 Mile to the North	Construct bridge overlay 2 lanes	0.50	2	2	Local	1,200,000
1999	Mesa	Baseline Rd: Ellsworth Rd to Crismon Rd	Widen road, add 1 lane	1.00	4	5	Private	600,000
1999	Mesa	Ellsworth Rd: Baseline Rd to Guadalupe Rd	Widen road, add 2 lanes	0.50	2	4	Private	300,000
2000	Chandler	Queen Creek Rd: Arizona Ave to Gilbert Rd	Reconstruct to 4 lanes	3.50	2	4	Private	6,000,000
2000	Gilbert	Higley Rd: Baseline Rd to Guadalupe Rd	Reconstruct width to 94 ft cross section	1.00	2	6	Private	1,500,000

Note: All costs are local costs, no Federal costs were programmed for any of the projects.



WILLIAMS GATEWAY AIRPORT AND WILLIAMS CAMPUS ROADWAY NETWORK

The Master Plan for the Williams Campus (January 1996) was examined to identify the existing circulation system of the Williams Gateway Airport and Williams Campus. The proposed transit, pedestrian and roadway circulation systems for the Airport and Campus were obtained from the Williams Campus Master Plan document, the Williams Reuse Plan Update, and the Williams Gateway Airport Master Plan.

Existing Circulation Network

The existing transportation system for the Airport and Campus is illustrated in Figure 2-12. The primary access to the Airport and Campus is provided by Power Road and Williams Field Road (Chandler Boulevard). Both are four lane principal arterial streets that intersect adjacent to the main entrance. Williams Field Road extends east of Power Road into the Airport and Campus. Inside, Williams Field Road splits into two one-way private collector streets, eastbound on "D" Street and westbound on "E" Street. Northbound on Front Street between "D" Street and "E" Street completes a long rectangular counterclockwise one-way loop through the core of the former base (Front Street provides two-way traffic). From this counterclockwise one-way collector roadway system a series of local streets in a grid system provide access to the remainder of the former base. The local streets are approximately 20 feet in width. Additional secondary collector roadways include Coolidge, "B" and "G" Streets in the east/west direction; and 1st, 5th, 11th, and 15th Streets in the north/south direction. The loop formed by 11th, "B", 1st and "G" Streets provides a continuous two-way route around the core of the former base. From the north end of the golf course a road loops around the runways connecting with the south end of 15th Street. This road has restricted access.

Currently, a total of 3,700 parking spaces are provided in the more than 50 surface parking lots on the Airport and Campus properties. The only continuous pedestrian walkway exists along the loop road.

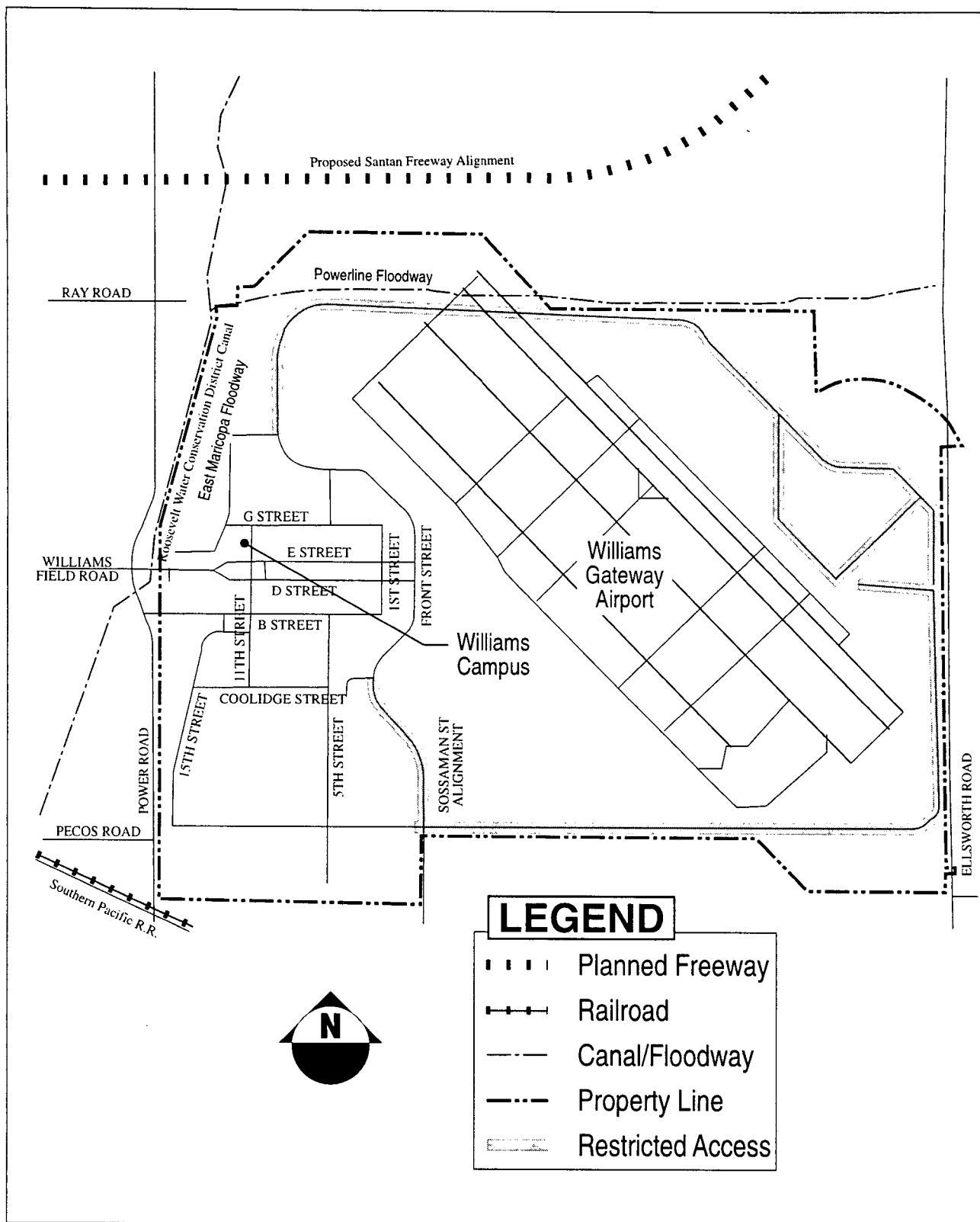


Figure 2-12
Williams Gateway Airport/Williams Campus
Existing Roadway Network

Proposed Circulation System

The planned roadway system and traffic circulation for the Williams Gateway Airport and Williams Campus is illustrated in Figure 2-13. Separate access will be provided to the two main uses. Ray Road will be extended to become the main entrance to the Williams Gateway Airport. Williams Field Road will provide the main entrance for the Williams Campus and to the Williams Golf Course. Sossaman Road, a major collector currently under design would traverse through the Williams Gateway Airport between future Ray Road and future Pecos Road.

Additional access to the Williams Campus will be provided through two other primary entrances and two secondary entrances: The two other primary entrances include 5th Street at the planned Sossaman Road, and a pair of one-way streets along the "D" and "E" Street alignments from the planned Sossaman Road. The two secondary entrances include 5th Street at the planned Pecos Road and 15th Street at the planned Pecos Road. The entrances will provide access to a one-way counterclockwise Campus Loop Road System. The Campus Loop Road System will utilize "B" Street for eastbound travel, 2nd Street for northbound travel, "G" Street for westbound travel, and 11th Street as for southbound travel. Many local streets and portions of "D" and "E" Street will be removed.

Additional access to the Williams Gateway Airport and the industrial and commercial areas will be provided by the planned Sossaman Road. Sossaman Road (a primary collector street) will traverse through the Williams Gateway Airport Business Park. A proposed minor arterial street provides additional access to the northwest corner of the airport connecting at Ray Road and Ellsworth Road. A major arterial (Hawes Road) will extend north of Ray Road to the Santan Freeway where a traffic interchange is being proposed by the Airport Authority.

Ten surface parking lots are planned to replace the existing parking lots. The new lots will provide a total of 15,100 parking spaces. A network of 20 foot pedestrian walkways will be developed to serve the entire Williams Campus. Pedestrian walkways will replace the existing "D", "E", 4th, and 7th Streets. Figure 2-14 illustrates the planned transit, bicycle and pedestrian circulation. A secondary network of pedestrian walkways will utilize the former "C" and "F" Street alignments in an east/west direction and the former 3rd, 5th, and 6th

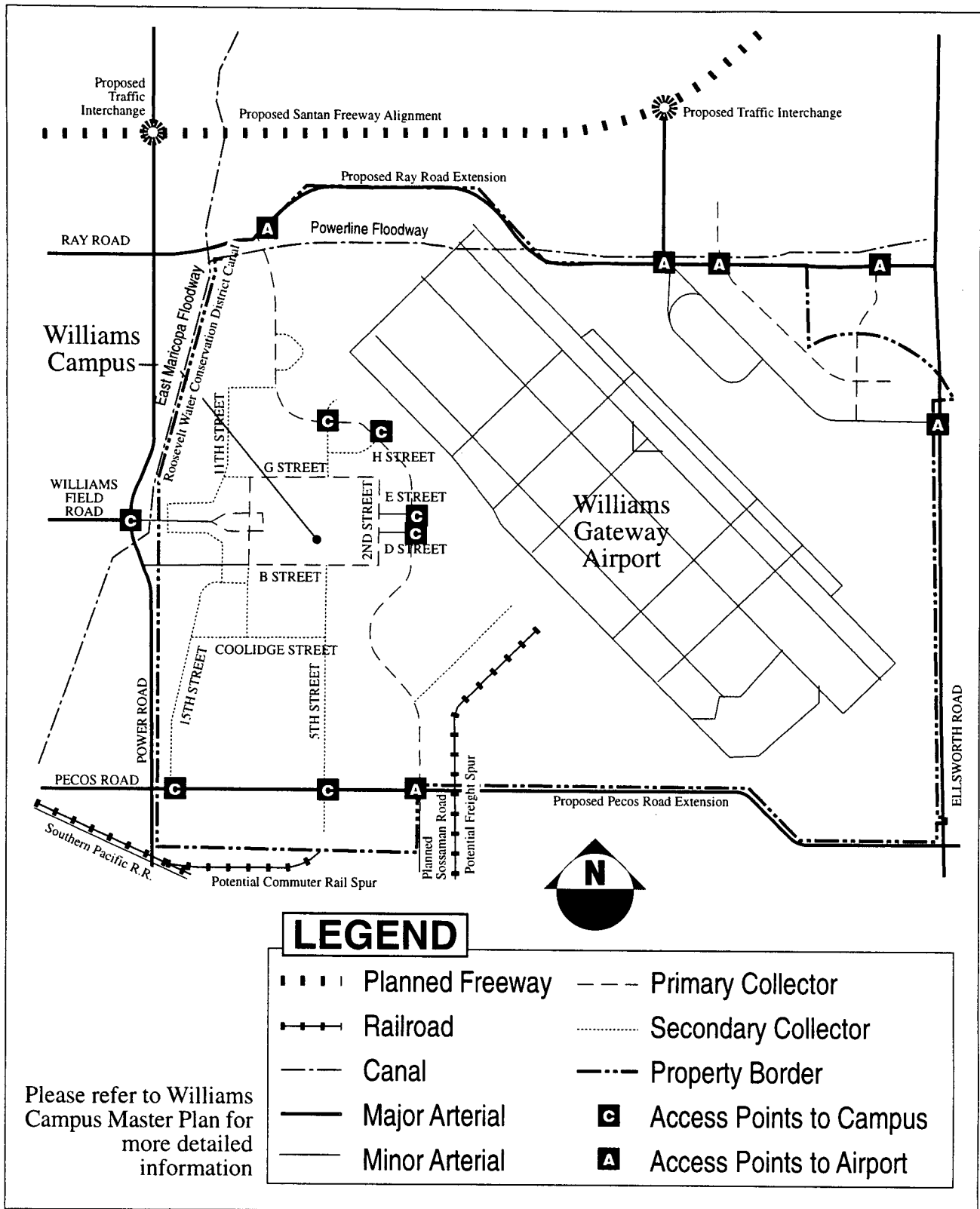


Figure 2-13
Williams Gateway Airport/Williams Campus
Planned Roadway Network

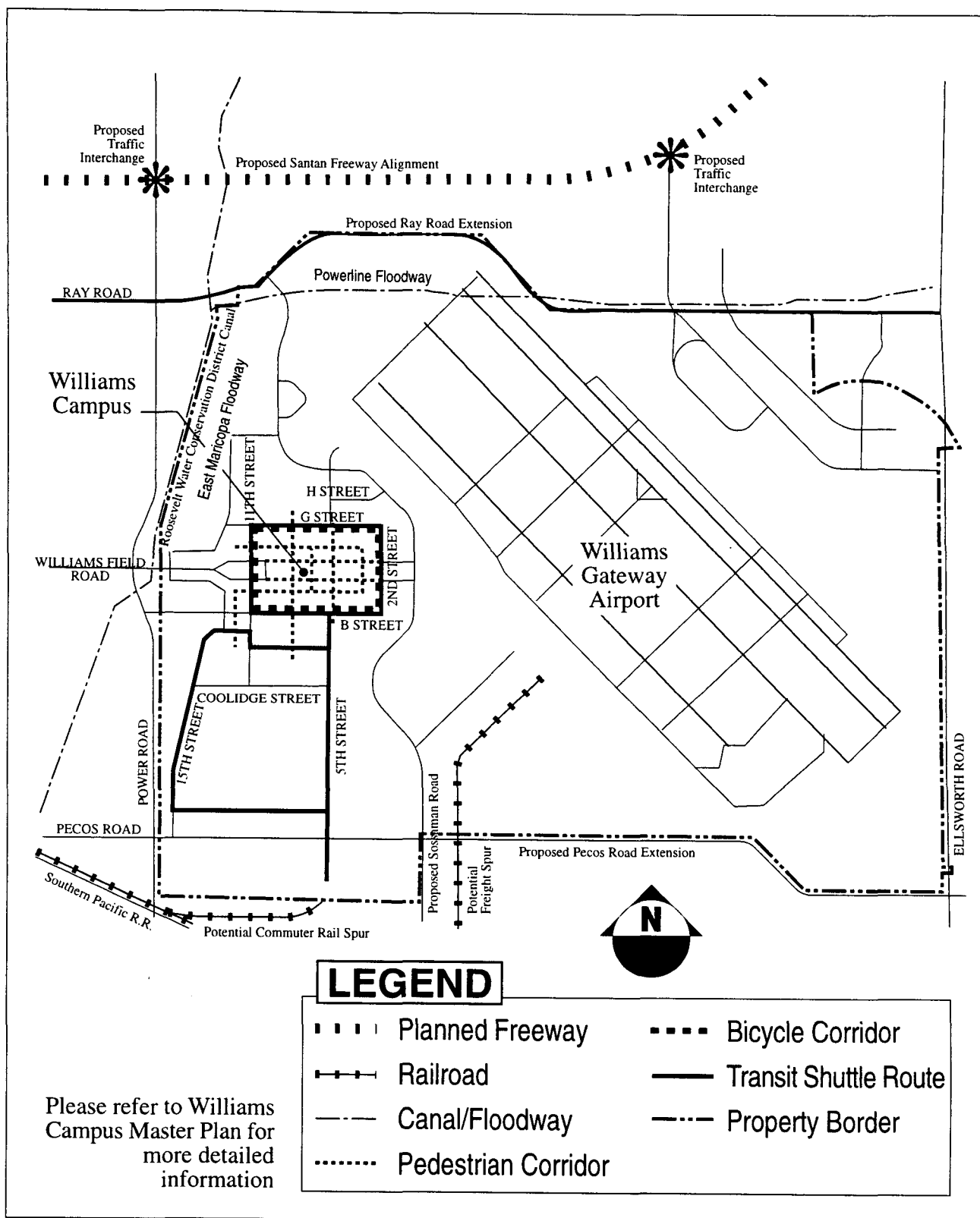


Figure 2-14
Williams Gateway Airport/Williams Campus
Transit/Bicycle and Pedestrian Network

Street alignments in a north/south direction. The secondary pedestrian walkways will be 10 to 12 feet in width.

A Campus Transit Loop will be developed and run parallel to the Campus Loop Road system. The Campus Transit Loop will consist of a 20 foot wide paved corridor with 12 feet dedicated to transit shuttle vehicles and 8 feet designated for two-way bicycle lanes. An extension of the transit loop runs along 5th Street to the remote parking areas. The operation and users of both the Campus Loop Road and the Campus Transit Loop need to be considered during the design of the Transit Loop. The operation of the intersections with regard to pedestrians, bicycles, buses, and automobiles also need to be considered.

3. SOCIOECONOMIC DATABASE

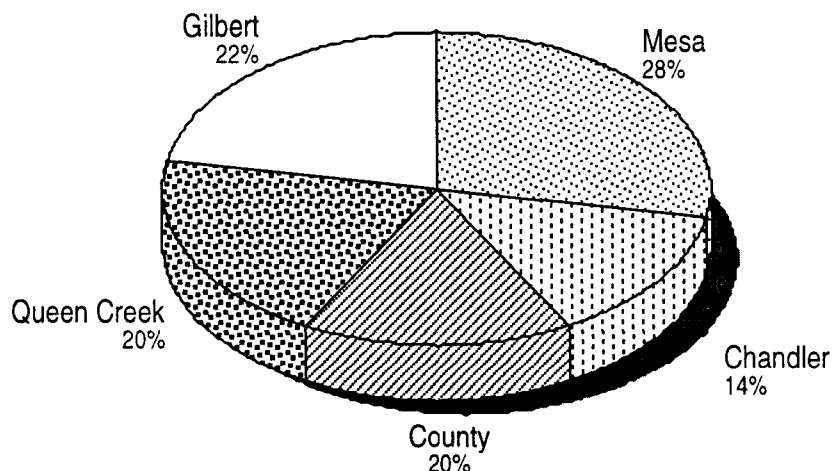
BACKGROUND

This chapter provides a summary of the socioeconomic projections developed for the WATP study area. The data presented here was taken from Final Technical Report Number 2, Socioeconomic Projections, August 28, 1996, which was prepared by Applied Economics for the WATP.

INTRODUCTION

Transportation planning is a regional issue, and one which is affected by numerous considerations including physical, social, and economic traits. While the driving force of this study is the Williams Gateway Airport/Williams Campus, the area included in this study comprises approximately 93,500 acres (146 square miles). The land area is distributed among the Municipal Planning Areas (MPAs) of Mesa, Gilbert, Chandler, Queen Creek, and unincorporated Maricopa County as shown in Figure 3-1. MPAs, which are used for regional long term planning, include incorporated and unincorporated land area in the influence area of each jurisdiction. Areas in Pinal County bordering the study area have also been examined for potential impacts on the study region.

Figure 3-1
Study Area Acreage by Municipal Planning Area



An initial step in the transportation planning process is to identify land development issues and forecast socioeconomic conditions. This chapter examines historic growth trends, details current and future land use information, and presents population and employment projections for the WATP Study Area. It also contains allocations of population and employment growth to small geographic units. In general, these units are approximately one square mile bounded by section lines, the typical alignment of arterial streets in the Phoenix metropolitan area.

The balance of this chapter is comprised of three sections. The following section presents an overview of the activities that have occurred, and are expected to occur at the Williams Gateway Airport and Williams Campus. This is important since they are the key stimulus to expanded growth and development in the study area.

The third section includes the development projections for the study area as a whole. Key assumptions and methodologies which form the basis for the projections are also discussed.

The final section introduces the small-area allocations of population, housing, and employment projections. Methodologies involved in developing control totals and allocations will be examined, including the process of modeling land uses individually, and projecting shares of development over periods of time.

WILLIAMS GATEWAY AIRPORT AND WILLIAMS CAMPUS

While transportation and land use issues are regional in nature there tend to be particular areas or locations that serve as the driving forces in development, or, as "magnets" for growth. Since the Williams Gateway Airport and Williams Campus are identified as the major growth nodes in the study area their development potential warrants additional consideration. The purpose of this section is to examine the amount and nature of development planned at the Airport and Campus, and what impact that development may have on the transportation system.

Williams Gateway Airport

The former Williams Air Force Base was reopened as the Williams Gateway Airport (WGA) in March 1994. The Williams Gateway Airport Authority (WGAA) was established shortly thereafter and given responsibility for operations and development. The Airport serves as a reliever airport to Phoenix Sky Harbor International Airport, and is currently developing as an aerospace center. Uses include air cargo, planned commercial passenger service, aerospace manufacturing, general aviation, flight training and aircraft maintenance.

As noted in the 1992 Williams AFB Economic Reuse Plan, there are many reasons to expect the WGA to be a success as a satellite commercial service facility. The satellite concept has already been proven to work in several other metropolitan areas of the country and Sky Harbor is moving quickly toward usage capacity. This trend will obviously continue as the metropolitan area continues its rapid growth. Given the other uses, both current and anticipated, at Williams it is expected that employment growth at the Airport should be strong.

This trend is validated by the growth that has already taken place. Even though earlier predictions forecast air cargo operations to begin in the year 2000, in 1995 approximately 10 million pounds of cargo were shipped from WGA. Aerospace companies including Boeing, BF Goodrich, deHavilland, and McDonnell Douglas have already utilized the Airport for testing of aircraft and components, including the new Boeing 777. Flight operations have reached a level of over 157,000 take-offs and landings annually. Furthermore, commercial passenger flight operations are expected to commence by the end of 1997.

As pointed out elsewhere in this study, growth tends to feed off itself. The Williams Gateway Airport and Williams Campus, and the accompanying industrial uses, will tend to each support and complement growth in other sectors.

Williams Campus

The Williams Campus, also located on the former Williams Air Force Base, exists as a cooperative effort of Arizona State University (ASU) East, the Maricopa Community College District (MCCD), University of North Dakota Aerospace Flight Training Center, Embry-Riddle Aeronautical University, the USAF Armstrong Laboratory, and Project

Challenge. The intent of the multi-institutional approach is to provide for a wide array of educational, research, and training facilities while minimizing duplication of efforts.

Classes at the Williams Campus began in the Spring of 1995, with approximately 200 students enrolled in aviation and other technological programs. The fall semester of 1996 has an enrollment of over 1,000 students. The fact that the ASU West Campus has taken only about 7 to 8 years to reach a student population of 5,000 is an indication of the rapid growth that can be expected at the Williams Campus.

ASU is transferring all of its agribusiness and industrial technology programs to the Williams Campus to take advantage of the unique nature of the site. While MCCD and ASU has begun offering complete associate, bachelor's and master's degree programs, it may be expected that a primary focus will remain on aviation and related technological programs, as well as fire science and agribusiness.

Industrial Development at Williams

Approximately 25 percent of the employment lost when Williams Air Force Base closed in 1993 had been replaced within two years, with about 1,000 jobs on-site by the fall of 1995. Approximately 800 of these jobs were industrial occupations as the private sector began to utilize the existing facilities at Williams Gateway Airport. As of April 1996, there were 14 tenants at WGA, primarily in the aviation industry.

As expressed elsewhere in this study, the region around Williams is rapidly growing in terms of economic/employment development. This growth process can be expected to accelerate with the development at Williams Gateway Airport. Industrial development at WGA is already occurring with the reuse of existing facilities, and the airport site offers substantial room for new building on each side of the runways with development plans already in place.

Other Attributes

In addition to the primary development components, Williams Gateway Airport and Campus offer other attributes that are difficult, if not impossible, to quantify. These amenities

increase the attractiveness of the area for future development. Examples include the following:

- The Gila River Indian Community is operating the Williams Golf Course which is located at the northwest edge of the Williams Gateway Airport and Williams Campus. While golf courses are certainly common in this metropolitan area, it is not common to find one located adjacent to an airport/industrial park. This unique feature of the site is one that may well be considered an added amenity for businesses considering locating at Williams.
- As the largest airport in the East Valley, Williams Gateway Airport is ideally suited for aviation-related events. Two such events are already in place: the Copper State Fly-In and the Phoenix 500 Air Show. These events draw several thousand visitors to the Airport, and help to increase awareness of the revitalization and development taking place there.
- Williams has been identified as one of the environmentally cleanest former military bases in the United States, and active remediation of the small areas of contamination is already underway. These areas account for only about 3% of the Base land area, and pose little hazard. This comparative cleanliness of the environment, and the fact that steps have been initiated to address the few concerns which are present, can be considered an amenity in that environmental impacts of pre-existing conditions will not be a development issue for future users.
- The Homeless Providers and Veteran's Administration are located on the Williams Campus providing valuable community service. Seven hundred housing units exist on the property. Currently 215 are available for occupancy and there is a waiting list for these units.

The cooperative combination of the Airport, Campus, industrial users, and other activities helps to create a vitalized and energetic atmosphere conducive to development. With planning for the area already in place, redevelopment and new development can proceed in an orderly fashion rather than in a less coordinated piece-meal effort.

GROWTH PROJECTIONS

The fact that employment levels, as well as population levels, are increasing in the County, and particularly in Southeast Maricopa County is a given. However, there remains the issue of where specific growth nodes will occur. Prior to 1991, the use at Williams was

stable. It had been an Air Force training center since 1941, and was expected to remain so. Employment levels were basically "fixed." Now converted to private use as the Williams Gateway Airport, the facility can grow and act as a stimulus to development in Southeast Maricopa County. Williams Gateway Airport has a fully constructed airport with three of the longest runways (10,500 feet) in the Phoenix regional aviation system, and the ability to provide service to virtually any aircraft.

In addition, the former air base has also become the home of the Williams Campus, a cooperative effort between Arizona State University (ASU), the Maricopa Community College District, and other public and private institutions. In view of these facts, the capacity for expansion already present at Williams, and the tendency for recent economic growth to attract additional economic growth, it seems very likely that development once anticipated for other areas of Greater Phoenix may instead occur at the Williams Gateway Airport and the surrounding area.

The development assumptions for the Williams Gateway Airport and Williams Campus shown in Table 3-1, are primarily the result of discussions with the Airport Authority and ASU East. Non-campus employment is expected to increase rapidly along with usage of the airport for air cargo service. Student population, and therefore staff employment, at the campus is also expected to increase quickly, as ASU is moving certain departments from the Main Campus in Tempe to the East Campus at Williams. Former base housing is already being taken up and is expected to be occupied to capacity before the year 2000.

As these direct impacts occur, indirect impacts will follow. The increase in industrial employment will encourage growth of supplier operations as well as other business services. The increase in student population and the utilization of on-campus housing will encourage additional residential development, retail operations, and service-oriented businesses. As all of this occurs and the area reaches a higher overall level of economic maturity, it will become more attractive to other large scale users, thus repeating the cycle of economic expansion.

**Table 3-1. Williams Gateway Airport and Williams Campus Development
1995-2015**

	Total	Employment by Land Use				
		Retail	Office	Industrial	Public	Other
Study Area Total						
1995	9,795	2,930	185	4,489	847	1,344
2000	17,289	3,611	560	8,713	2,860	1,544
2005	28,219	5,867	1,310	14,074	5,173	1,794
2010	42,204	9,753	2,185	20,548	7,673	2,044
2015	57,395	15,189	3,160	26,391	10,361	2,294
Williams Gateway						
1995	1,050	0	100	800	100	50
2000	4,103	50	250	2,500	1,250	53
2005	8,130	75	500	5,000	2,500	55
2010	12,158	100	750	7,500	3,750	58
2015	16,186	125	1,000	10,000	5,000	61
Williams Gateway Airport Capture Rate						
1995 - 2000	40.7%	7.3%	40.0%	40.2%	57.1%	1.3%
2000 - 2005	36.8%	1.1%	33.3%	46.6%	54.0%	1.1%
2005 - 2010	28.8%	0.6%	28.6%	38.6%	50.0%	1.1%
2010 - 2015	26.5%	0.5%	25.6%	42.8%	46.5%	1.2%

Source: Applied Economics, 1996.

STUDY AREA GROWTH PROJECTIONS

Population and Housing

The rate of residential development in the study area could also be expected to accelerate as a result of the increased economic activity occurring at WGA, however the projections prepared by MAG in 1993 already included a significant amount of residential growth. Analysis of MAG's projected population growth in the study area, relative to recent County-level population and employment growth, indicated that study area population projections are only slightly higher than MAG's.

Table 3-2 shows projected study area growth in housing units, population and employment. The projections serve as control totals for growth within the study area as a whole. Study area growth is based on MAG growth allocations and the direct, and indirect, consequences of expanded growth at Williams Gateway Airport and Williams Campus.

**Table 3-2. Williams Gateway Airport and Williams Campus Growth Projections
1980-2015**

	1995	2000	2005	2010	2015
EMPLOYMENT	1,000	4,000	8,000	12,000	16,000
Williams Gateway Airport					
Office	100	250	500	750	1,000
Industrial	800	2,500	5,000	7,500	10,000
Williams Campus					
Staff	100	1,250	2,500	3,750	5,000
POPULATION					
Resident Units					
Dormitory	312	600	600	600	600
Other	714	714	714	714	714
Occupied Units					
Dormitory	312	600	600	600	600
Other	350	714	714	714	714
Population per Unit					
Dormitory	1.33	1.33	1.33	1.33	1.33
Other	2.75	2.75	2.75	2.75	2.75
Total Population	1,440	2,720	2,720	2,720	2,720
STUDENTS	1,407	5,000	10,000	15,000	20,000

Sources: Williams Gateway Airport Authority, ASU East, and Applied Economics, 1996.

Study Area Employment Projections

Employment projections for the study area are shown distributed by land use in Table 3-3. The distribution by land use is based on MAG's projections by land use, adjusted for the impacts of Williams Gateway Airport growth. Williams area employment has been allocated to specific land use categories based on information from the Airport Master Plan and Williams Campus Master Plan. In general, development at Williams will be much more concentrated in industrial and public (educational) uses than the study area as a whole.

The figures for the airport capture rate, that is, the airport growth compared to the study area total, utilize the employment assumptions for the Williams Area introduced in Table 3-1. Given these assumptions, the capture rates shown in the last section of Table 3-3 appear quite reasonable with no apparent anomalies. The capture rates for the Williams Area are quite high in the early periods, then taper off as other portions of the study area mature sufficiently to support employment growth and absorb the indirect economic impacts of development at the Airport.

One exception to these declining capture rates is industrial employment where the Williams Gateway Airport capture rate is projected to remain about the same over the next 20 years. This is due to the position of the airport as the core area for economic development. While beginning from a relatively limited base due to the change from public to private use, the airport area would be expected to attract the majority of industrial users to the area, while most of the indirect impacts would be spread out beyond the Airport.

SMALL-AREA PROJECTIONS

The goal of the preceding socioeconomic assessments and projections was to create a structured foundation upon which to base small-area allocations of residential and employment growth and development in the Williams study area. The final step is the actual assignation of control totals, and the allocation of growth by Traffic Analysis Zone (TAZ) and by time period. The TAZ map developed for this study is shown in Figure 3-2.

**Table 3-3. Southeast Maricopa County Growth Projections
1995-2015**

	Maricopa County		Study Area			
	Total	Annual Growth	Total	Annual Growth	Percent of County	Percent of Growth
Population						
1980	1,509,052		14,771		1.0%	
1985	1,837,956	4.0%	19,746	6.0%	1.1%	1.5%
1990	2,130,400	3.0%	25,643	5.4%	1.2%	2.0%
1995	2,454,525	2.9%	36,111	7.1%	1.5%	3.2%
2000	2,777,070	2.5%	58,673	10.2%	2.1%	7.0%
2005	3,096,287	2.2%	97,534	10.7%	3.2%	12.2%
2010	3,418,551	2.0%	151,890	9.3%	4.4%	16.9%
2015	3,737,498	1.8%	203,040	6.0%	5.4%	16.0%
Housing Units						
1980	593,315		4,628		0.8%	
1985	806,186	6.3%	8,003	11.6%	1.0%	1.6%
1990	955,119	3.4%	11,638	7.8%	1.2%	2.4%
1995	1,100,433	2.9%	16,548	7.3%	1.5%	3.4%
2000	1,257,490	2.7%	25,573	9.1%	2.0%	5.7%
2005	1,402,035	2.2%	41,117	10.0%	2.9%	10.8%
2010	1,547,960	2.0%	62,859	8.9%	4.1%	14.9%
2015	1,692,383	1.8%	83,320	5.8%	4.9%	14.2%
Total Employment						
1985	905,815		7,304		0.8%	
1990	1,028,100	2.6%	9,118	4.5%	0.9%	1.5%
1995	1,277,000	4.4%	9,795	1.4%	0.8%	0.3%
2000	1,480,393	3.0%	17,289	12.0%	1.2%	3.7%
2005	1,650,561	2.2%	28,219	10.3%	1.7%	6.4%
2010	1,786,899	1.6%	42,204	8.4%	2.4%	10.3%
2015	1,915,534	1.4%	57,395	6.3%	3.0%	11.8%

Sources: Population and Housing - U.S. Bureau of Census, 1980, 1985, 1990 and 1995.
Employment - Maricopa Association of Governments, 1984, 1987 and 1993.
1995 County Employment - Arizona Department of Economic Security, 1996.
1995 Study Area Estimates - Applied Economics, 1996.

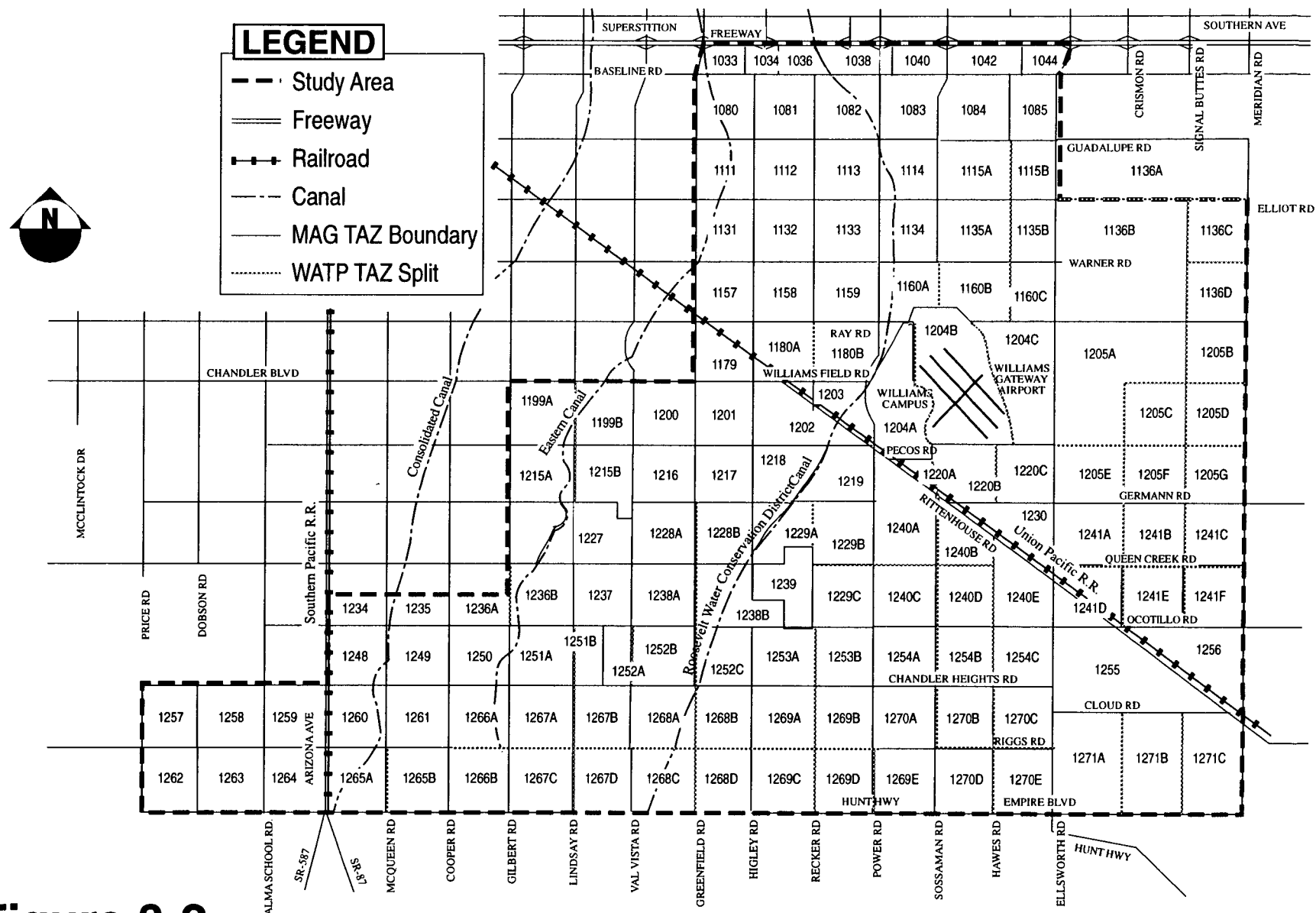


Figure 3-2 Traffic Analysis Zone Splits

Methodology

Working from previous studies and reuse plans for the Williams Gateway Airport and Williams Campus, and discussions with persons involved in the development around the Airport, it was possible to forecast development within that area with a reasonable degree of certainty.

Control totals for areas outside Williams were derived using MAG forecasts, with adjustments made to account for more recent and/or more specific information regarding particular areas. The Williams Gateway Airport projections were then subtracted from the study area total to provide control totals for the remainder of the study area. This remainder was then allocated throughout the TAZs. The methodologies used in identifying the development potential, development timing, and growth allocation for each TAZ are discussed in detail in the Socioeconomic Projections Technical Report.

Housing and Population Projections

Residential development potential was modeled using a priority based allocation, to produce raw housing unit data. Then, the control totals were applied to produce benchmarked housing unit figures by TAZ, by time period. The results of this process, showing housing unit breakdown as well as totals by TAZ, are shown in Appendix Table A-1. Maps showing the distribution of housing growth by TAZ for 1995 to 2005, and 2005 to 2015, are shown in Figures 3-3 and 3-4, respectively.

Housing unit data was then processed by another model to calculate population based on residential density factors and benchmarked population figures. The results of this procedure, also by TAZ, are shown in Appendix Table A-2.

Employment Projections

Nonresidential development potential was modeled, again using a priority share system, to produce raw employment figures. Control totals were then applied to produce benchmarked employment data. This process was repeated for each employment-producing land use, with the results by TAZ shown in Appendix Table A-3. Maps showing the distribution of employment growth by TAZ for 1995 to 2005, and 2005 to 2015, are shown in Figures 3-5 and 3-6, respectively.

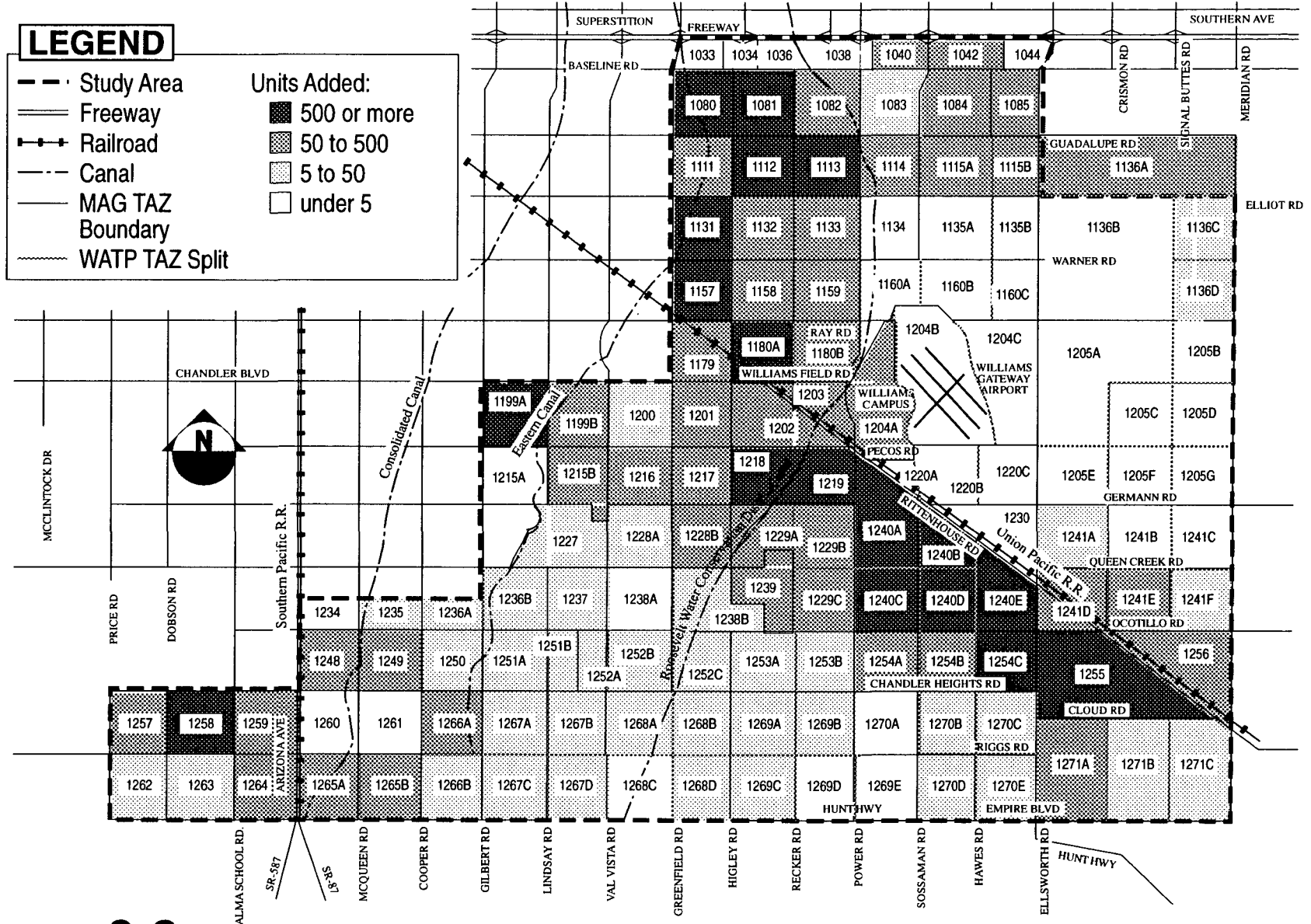
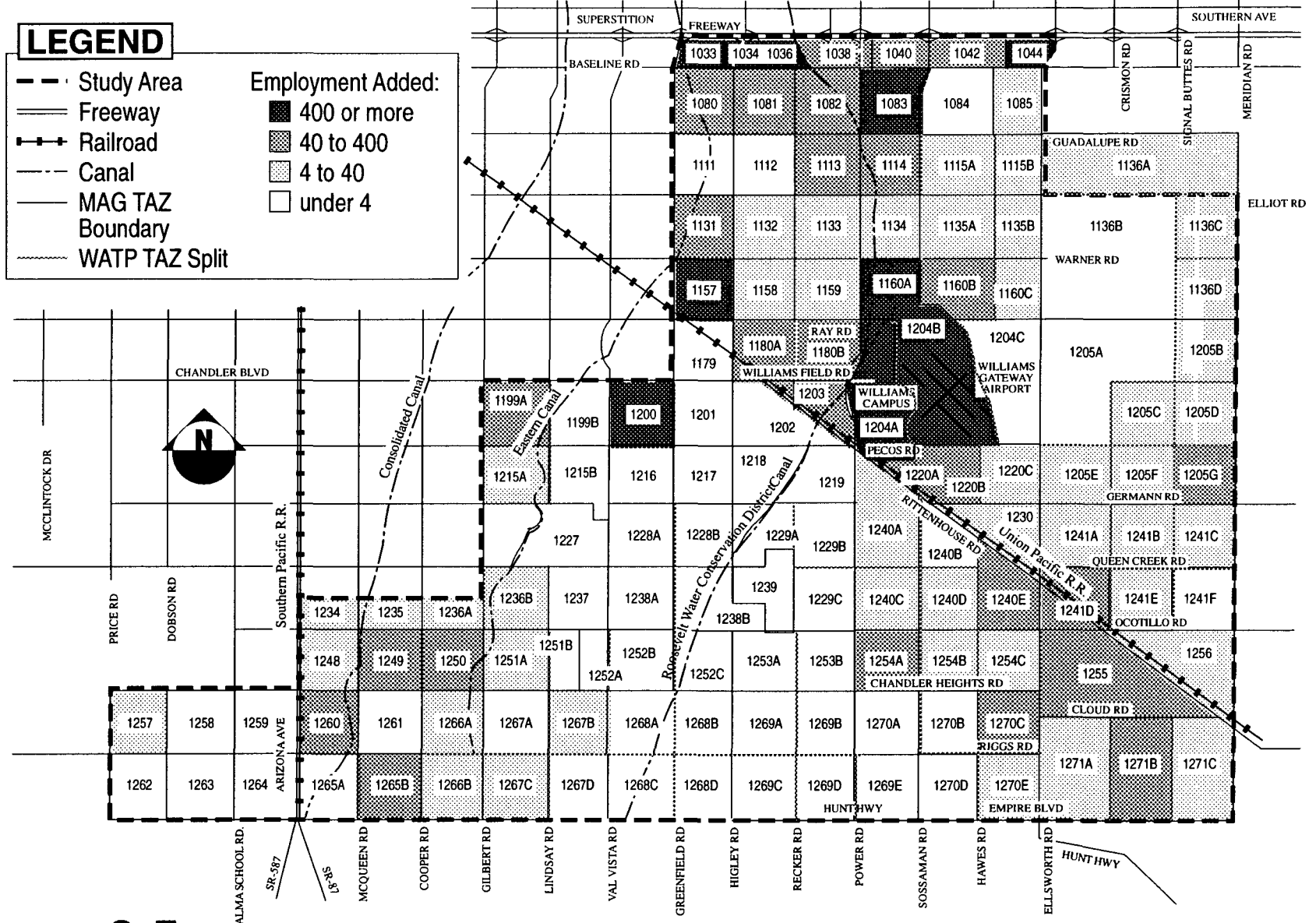
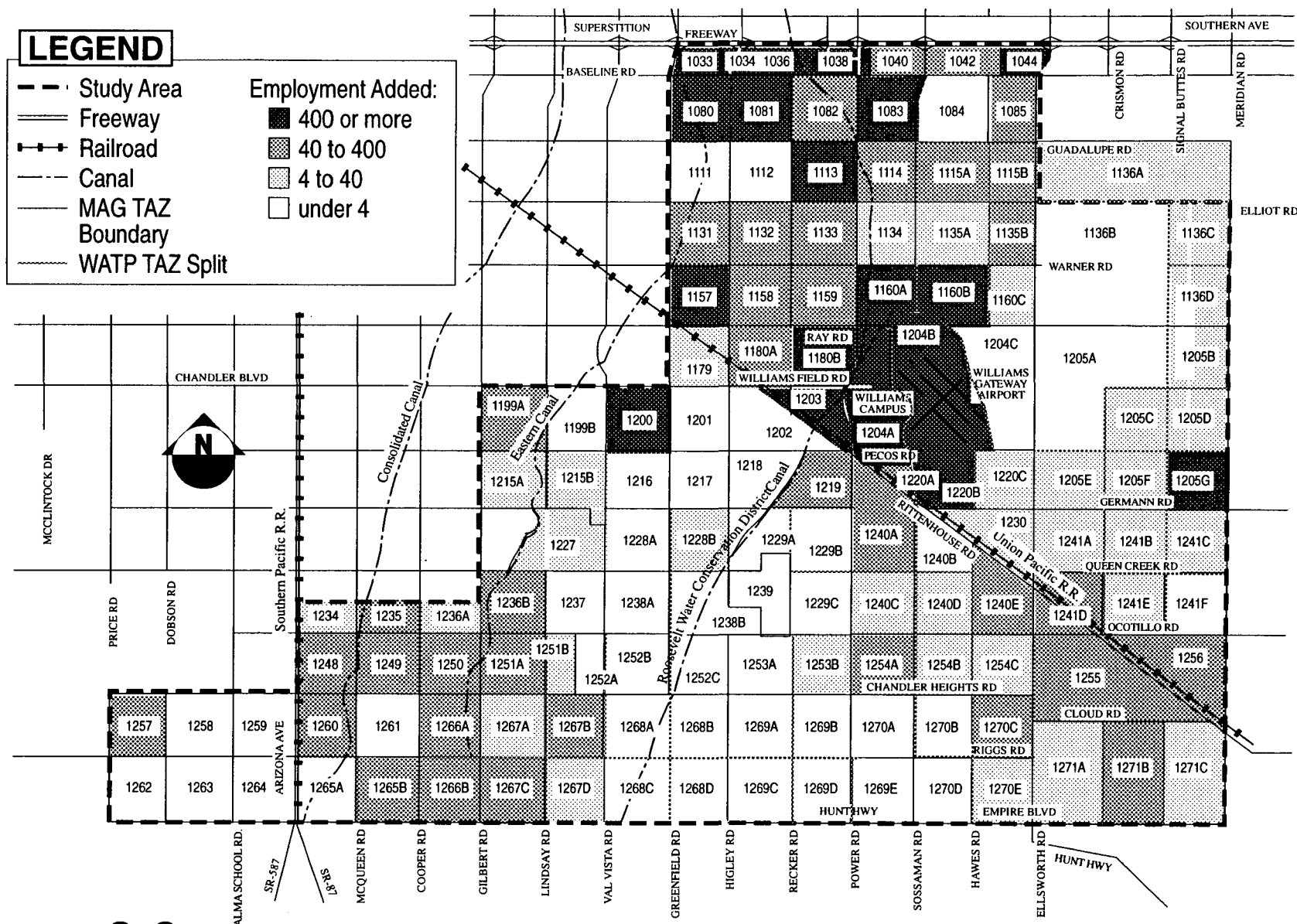


Figure 3-3
Year 1995-2005 TAZ-Level Housing Unit Additions







4. TRAVEL DEMAND MODEL

A major step in identifying the transportation improvements needed for the Williams area was to develop a transportation model. The transportation model was used to forecast traffic volumes for the Williams Area based on the socioeconomic projections discussed in Chapter 3. This chapter will discuss the transportation modeling process and state the assumptions used when running the model.

WATP MODELING PROCESS

A travel demand model was developed by Lima & Associates exclusively for use in this project. The Maricopa Association of Governments Transportation and Planning Office (MAGTPO) transportation model was used as the cornerstone upon which to build the Williams Area Transportation Plan (WATP) travel demand model. The MAG transportation model operates using EMME2 software. The WATP model was developed using TRANPLAN software, therefore, some changes were necessary to convert the MAG model from its original EMME2 format into TRANPLAN format. However, no changes were made to the trip generation variables, calculations, or algorithms. The WATP model does not include the MAG transportation model enhancements of mode split estimation and feedback of congested speeds. However, the transit demand for the William Area is being estimated separately using the person trips estimated by the WATP model.

The WATP travel demand modeling process includes the following steps:

- Development of a Williams Area transportation network.
- Determination of land use and socioeconomic data.
- Trip generation - the forecasting of person trips.
- Trip distribution - geographical distribution of vehicle trips between origins and destinations.
- Vehicle Occupancy Factors-determination of the persons per vehicle for each trip purpose.
- Trip Assignment - the assignment of traffic volumes to specific routes.

The following sections provide an overview of each of the six traffic forecasting steps and changes made to the MAG transportation model. Details on the MAG model are provided in the User's Guide for the MAG Travel Demand Model.

Transportation Network

A highway network consists of nodes and links. A node is an intersection of two or more links, such as an intersection of two streets. A network link is a segment between two nodes. An example of a network link is the segment of Power Road between Ray Road and Warner Road. Various traffic and physical characteristics are associated with each link in the network, including distance, speed, link capacity, and number of lanes. The transportation network also includes Transportation Analysis Zones (TAZ) which are the basic geographical units used for land use and trip generating estimates. The TAZs are generally bounded by major streets (links) in the transportation network. A TAZ is defined in the network by a node called a centroid. Each TAZ centroid is connected to a network link by "dummy links" called centroid connectors, which function as surrogates for the local or neighborhood street system. For transportation modeling purposes, all trips within a TAZ are assumed to be generated at the centroid.

The 1995 base network for the Williams Area Transportation Plan is the MAG 1995 regional network modified to reflect a revised zonal structure in the WATP area and actual 1995 roadway conditions. Figure 2-4 in Chapter 2 illustrates the WATP TRANPLAN network with the number of lanes (same as the existing 1995 roadway network).

The MAG 1995 regional network was converted from the EMME2 format to the TRANPLAN format. The TAZs in the WATP area were then revised in accordance with the TAZs defined for the development of socioeconomic estimates. New TAZ connectors were then coded to reflect the revised TAZ structure. The following MAG link attributes are coded in the 1995 network: 1) number of lanes; 2) functional classification; and 3) area type.

The link functional classification and area type designation is computed using the MAG 1995 link functional classification table and the MAG LINKTYPE FORTRAN program. Link speeds and capacities are internally computed using the MAG speeds and capacity default tables which are based on functional classification and area type.

Socioeconomic Forecasting

As noted above, the original MAG TAZs were revised in the WATP area. The traffic forecasting model contains 1,330 TAZs, 58 more TAZs than the MAG model. The socioeconomic characteristics of a TAZ such as the number of dwelling units and the number of employees are among the primary indicators of the amount of trips generated or destined to a particular TAZ. The following socioeconomic forecasts were revised for the WATP by Applied Economics, Inc. and are detailed in the Appendix. The socioeconomic variables for each TAZ are:

- Total Population
- Dwelling Units
- Miscellaneous Employment
- Public Employment
- Retail Employment
- Office Employment
- Industrial Employment

The forecasted income for each zone was retained from the MAG socioeconomic data. For the socioeconomic estimates, the new zones added by Applied Economics, Inc. were identified using the MAG zone number plus an alpha character. For example, the original MAG TAZ numbered 1115 was split into two zones which were labeled as 1115A and 1115B. However, due to limitations dictated by the TRANPLAN software, zone numbers must be strictly in numeric values. Therefore, the new zones were renumbered.

Trip Generation

The product of the trip generation phase of the modeling process is an estimate of the total number of person trips which are anticipated to be produced within and/or attracted to each TAZ. A trip is defined as a one-way movement between an origin and a destination zone. The total number of trips generated or attracted to a TAZ are a function of the TAZ's residential and/or commercial land use and the socioeconomic data assumptions. Residential

land use is generally referred to as a “producer” of trips, while commercial land use is generally referred to as an “attractor” of trips.

The WATP model estimates trips using the MAG Trip Generation FORTRAN Programs which were converted from the UNIX FORTRAN version to the PC FORTRAN version. The programs were modified to input the revised total number of new TAZs and to output the TRANPLAN trip generation data files. The FORTRAN Programs estimate internal trips and external-to-internal trips. An internal trip is a trip that has both origin and destination inside the region.

Internal trips are generated for the following purposes in the MAG trip generation programs:

- Home-based work for income group 1 (Less than \$10,000)
- Home-based work for income group 2 (\$10,000 to 14,999)
- Home-based work for income group 3 (\$15,000 to 22,499)
- Home-based work for income group 4 (\$22,500 to 29,999)
- Home-based work for income group 5 (30,000 and above)
- Home-based shopping
- Home-based other
- Home-based school
- Home-base other university
- Non home-based work
- Non home-base other

An external vehicle trip is a trip which has either an origin or destination outside the region. External trips include the following types: external-to-internal, internal-to-external, and external-to-external. As an example, a vehicle trip from Florence in Pinal County to Mesa in Maricopa County constitutes an external-to-internal trip, while the return trip is an internal-to-external trip. An external-to-external trip originates and ends outside the region. A trip from Flagstaff to Tucson via I-17 and I-10 without stopping is an external-to-external trip. One of the input variables in the development of an external trip matrix is the traffic volume at the external stations. The 1995 MAG forecasted traffic volumes for the external stations were used as the external volumes. The external-to-external trip matrix was

developed by factoring up the 1990 MAG external-to-external trip table presented in the MAG Transportation Model Documentation.

The volumes on Power Road adjacent to the Williams Campus was approximately 4,000 vehicles per day higher than the observed traffic counts. In order to understand this difference, the number of trips generated by the MAG trip generation programs for the Williams Campus and Williams Gateway Airport was compared to trip generation estimates using the Institute of Transportation Engineers (ITE) trip rates. The Williams Campus and WGA include TAZs 1204, 1282, and 1283 with TAZ 1204 containing all the academic institutions and their related activities. The comparison of the number of trips generated by the MAG model with those generated using ITE rates indicated that trips generated by the MAG model were approximately fifty percent higher for zone 1204. This difference is primarily due to the trip generating characteristics of the unique area. The current campus residents include students and low income residents which are assumed to generate fewer trips than higher income residents. In order to reflect this lower trip generation, the number of dwelling units, the mean income, and the FORTRAN generated home-based school productions and attractions for zone 1204 were adjusted to reflect the special trip generating characteristics. The WGA was thus treated as a special generator to ensure that all the projected growth is accounted for in all traffic forecasts. The MAG model did not account for air passenger trips, so these trips were added to zone 1282 for the year 2000 and 2005 traffic assignments (4,000 and 8,000 daily trips respectively) and to zone 1283 for the year 2015 traffic assignments (19,600 daily trips).

Trip Distribution

The purpose of the trip distribution is to distribute the generated person trips between TAZs. The product of the trip distribution phase is an origin and destination trip table which specifies the number of trips traveling from each TAZ to the remaining TAZs. The distribution of trips between TAZs is a function of the following variables:

- Number of person trips produced in a zone
- Number of person trips attracted to a zone
- Travel time between zones

The WATP traffic forecasting model uses a Gravity model similar to the MAG model to perform trip distribution. The final output of the trip distribution phase is a trip table which gives the number of person trips between the zones.

Vehicle Occupancy Factors

For the WATP travel demand model, the entire person trip matrix is used to estimate vehicle trips between zones. The vehicle-trip matrix is produced by dividing the person-trip matrix by the average auto occupancy rate for each trip purpose. Since the MAG model uses EMME2 macros to internally compute mode split and since vehicle occupancy rates by trip purpose for the MAG model were not listed in the MAG Transportation Model Documentation, other sources were researched in order to compile a list of occupancy rates. Vehicle occupancy rates outlined in the April 1995 ITE Urban Travel Characteristics Database, as well as auto occupancy rates from similar metropolitan areas were used to identify auto occupancy rates by trip purpose (see Table 4-1). The overall daily vehicle occupancy rate for the WATP model is 1.32 persons per vehicle. This value is approximately the same as the average vehicle occupancy reported in the MAG Vehicle Occupancy Study.

Traffic Assignment

The traffic assignment phase assigns trips traveling between TAZs to specific roadways in the study area. The product of the traffic assignment process is a network with traffic volumes assigned to each link segment. The number of trips allocated to a roadway is based on the travel time and level of congestion between the various zones. The WATP model uses equilibrium assignment to assign the vehicle trip table to the network. Equilibrium occurs when a trip in the system cannot be made by an alternate route without increasing the system's total travel time.

Table 4-1. Daily Automobile Occupancy Factors

Trip Purpose	Auto Occupancy
Home-Based Work Income 1	1.19
Home-Based Work Income 2	1.14
Home-Based Work Income 3	1.12
Home-Based Work Income 4	1.12
Home-Based Work Income 5	1.10
Home-Based Shopping	1.42
Home-Based Other	1.47
Home-Based School	2.19
Home-Based Other Universities	1.50
Non Home-Based Work	1.08
Non Home-Based Other	1.37
Overall	1.32

MODEL VALIDATION

The WATP traffic forecasting model was calibrated to simulate the 1995 traffic counts in the study area. For this, the model was run and the assigned traffic volumes were compared to the 1995 traffic counts. Vehicle speeds were altered for the street links in order to minimize the difference in the assigned volumes and 1995 traffic counts. Table 4-2 shows the final facility speeds used for the model calibration:

Table 4-2. Vehicle Speeds Used In Model Calibration

Facility	Area Type	WATP Speed	MAG Speed
Freeway	CBD through Rural	55	57-65
Arterial	CBD Fringe	34	29
Arterial	Urban	36	32
Arterial	Suburban	40	35
Arterial	Rural	45	42

As noted above, in order to validate the traffic forecasting model the assigned traffic volumes were compared to the 1995 traffic counts. The traffic counts used for the validation process were taken from the official MAGTPO 1995 Average Weekday Traffic, dated February 1996.

The following performance measures were reviewed to establish model accuracy:

- Percent difference between the observed and the assigned traffic volumes for the WATP area
- Percent root mean square error (RMSE) between the assigned and observed traffic volumes for the WATP area

When comparing observed volumes to assigned volumes, it is important to recognize that errors are contained in both the observed and the assigned volumes. Figure 15 in the report Calibration and Adjustment of System Planning Models outlines acceptable levels of model accuracy based on this performance measure. For observed volumes between 0 and 4,000, a desirable percent deviation is 20 percent or higher, while for observed volumes between 5,000 and 10,000, a percent deviation between 14 percent and 19 percent is desirable.

The RMSE measures the deviation between the assigned traffic volumes and the counted traffic volumes. The percent RMSE is calculated by dividing the RMSE by the average traffic count for a particular traffic volume group. A large percent RMSE indicates a large deviation between the assigned and counted traffic volumes whereas a small percent RMSE indicates a small deviation between the assigned and counted traffic volumes. Although there are not well defined standards to determine the accuracy of the model using the percent RMSE values, empirical observations have shown that assignment accuracy is best at high volume ranges such as 40,000 to 60,000 where the percent RMSE should be in the 15 percent range. At the low volume ranges such as 0 to 5,000, higher errors can be expected, generally running over 100 percent. As the volume increases, the percent RMSE should decrease.

The model validation was conducted as follows: 1) the performance measures were estimated for the study area as a whole; and 2) the performance measures were estimated for selected screen lines within the study area. A statistical analysis based on volume ranges was conducted to measure the performance of the model as a whole. The volume ranges for the

analysis are the same ranges used in the 1990 MAG model validation analysis. The results for the WATP model are summarized in Table 4-3.

Table 4-3. Performance Statistics By Volume Group - Williams Area

Link Volume	Percent RMSE	Number of Observations	Observed Average Count	Average Estimated Volume	Estimated/Observed Volume
0 to 2,499	71.5%	264 *	1,113	1,259	1.13
2,500 to 4,999	39.0%	82	3,634	3,297	0.91
5,000 to 9,999	30.2%	40	6,275	5,964	0.95
10,000 to 19,999	53.7%	10	15,400	19,608	1.27

Note: Excludes Superstition Freeway

Count data source "1995 MAGTPO Average Weekday Traffic" volumes map.

* The total number of links in this range is 388, but only 264 have counts greater than 0.

The percent RMSE for the various volume groups are within acceptable ranges. However, the percent RMSE for the highest volume group is higher than expected. A reason for this could be that the number of observations in this category was low. The estimated/observed ratios are also within an acceptable range.

Figure 4-1 displays the ten screen lines developed for the WATP area. A screen line is a barrier across which there are a limited number of crossing points. For the WATP traffic assignments, screen lines were drawn onto the study area. Only major arterial streets (or links in the WATP model) cross these screen lines. Therefore, a comparison between the observed traffic volumes crossing the screen line (the sum of the volume on all arterial streets crossing the screen line) versus the estimated (or model produced) volumes crossing the screen line. The results of the WATP model screen lines comparison are summarized in Table 4-4. The estimated/observed ratios are also within an acceptable range. Although the Superstition Freeway is outside the study area, a comparison of the assigned volumes with the observed counts was made and is presented in Table 4-5. Freeway links on the eastern portion of the study area show high ratios of estimated observed traffic volumes. However, the traffic counts in the eastern portion shown in Table 4-5 appear to be low. The reported 1996 traffic counts for locations between Higley Road and Power Road are lower than the 1991 counts.

**Table 4-4. Screenline Comparisons
Williams Area**

Screenline	Directional Traffic Count	Directional Estimated Volume	Estimated/Observed Traffic Volume
1	3,500	2,794	0.80
2	6,000	5,979	1.00
3	5,500	5,863	1.07
4	8,000	7,874	0.98
5	8,000	9,978	1.25
6	17,555	15,000	0.85
7	14,500	13,111	0.90
8	4,000	3,244	0.81
9	17,500	15,399	0.88
10	30,500	25,715	0.84
Average			0.94

Note: Excludes Superstition Freeway.

Traffic Count data source "1995 MAGTPO Average Weekday Traffic" volumes map.

**Table 4-5. Comparison Of Superstition Freeway
Estimated Volume With Observed Counts**

Location	Estimated Volume	ADOT 1995 Traffic Count ¹	Estimated/ Observed Traffic Volumes
Alma School - Country Club	140,800	135,000	1.04
Country Club - Mesa	129,000	136,000	1.04
Mesa - Stapley	129,000	122,000	1.06
Stapley - Gilbert	134,000	107,000	1.25
Gilbert - Val Vista	104,000	101,000	1.03
Val Vista - Greenfield	103,000	90,000	1.14
Greenfield - Higley	93,000	74,000 ²	1.26
Higley - Superstition Springs	79,000	43,000 ³	1.84
Superstition Springs - Power	78,000	38,000 ⁴	2.05

1 ADOT Transportation Data Team, 7/1/96

2 1991 Traffic Count was 66,000 vehicles per day

3 1991 Traffic Count was 66,000 vehicles per day

4 1991 Traffic Count was 54,000 vehicles per day

FUTURE TRAFFIC ASSIGNMENT ASSUMPTIONS

The WATP model uses updated socioeconomic data from the Williams Area to determine trip generation. The base roadway network for the WATP model is the existing roadway network for the Williams Area. The 1995 WATP traffic assignment was run on this network. For the year 2000 WATP traffic assignment, new roadway links or roadway widenings that are planned by year 2000 as discussed by the technical committee or programmed in the 1996-2000 MAG Transportation Improvement Program were added to the base model. Figure 4-2 illustrates the changes made to the base network to develop the year 2000 WATP network. The year 2000 WATP network was used for both the years 2000 and 2005 WATP traffic assignments.

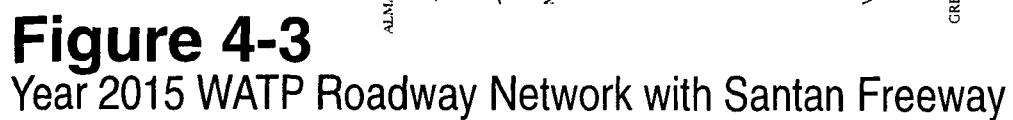
Figure 4-3 illustrates the network changes made to the year 2000 WATP network to develop the year 2015 WATP network. The changes made to the WATP network are not programmed, however, the added links appear as part of MAG's network for the year 2015. It was assumed that these links would be constructed as two lane roadways before the year 2015. The Santan Freeway was also included and assumed to be a four-lane freeway. US 60 was assumed to be a six-lane freeway plus one HOV lane in each direction west of Power Road.

Key assumptions made for the assigning of traffic on the roadway network for the years 2000 - 2015 WATP traffic assignments are:

- 100 percent of the traffic generated by developments in Pinal County east of Maricopa County were assigned to the study area.
- 50 percent of the traffic generated by Johnson Ranch in Pinal County was assigned to the study area.
- For the year 2015 WATP assignments, the airport terminal was located on the east side of the Williams Gateway Airport property.
- The Williams Gateway Airport was treated as a special generator to ensure that all projected growth is accounted for in the traffic forecasts.

Because of the potential impact that Johnson Ranch might have on the southeast corner of the study area, particularly Ellsworth Road, a sensitivity analysis was performed. The year 2015 WATP model with the Santan Freeway was run three times with 25 percent, 50 percent, and 75 percent of the Johnson Ranch traffic assumed to enter the study area





The only effects that Johnson Ranch traffic has on the study area roadway network is on Ellsworth Road between Hunt Highway and Ocotillo Road and on Riggs Road between Ellsworth Road and Higley Road. With each 25 percent increase in Johnson Ranch traffic assigned to the study area, the average daily traffic on Ellsworth Road increased 4,000 vehicles between Hunt Highway and Riggs Road (from 11,000 to 15,000 to 19,000 vehicles per day). On Ellsworth Road between Riggs Road and Chandler Heights Road, increases of 2,000 to 3,000 vehicles per day with each 25 percent increase in Johnson Ranch traffic assigned was observed (from 10,000 to 12,000 to 15,000 vehicles per day). A 1,000 vehicle per day increase per 25 percent increase in Johnson Ranch traffic assigned was observed on Ellsworth Road between Chandler Heights Road and Ocotillo Road (from 22,000 to 23,000 to 24,000 vehicles per day). Riggs Road showed a 1,000 to 2,000 vehicles per day increase per 25 percent increase in Johnson Ranch traffic assigned (from 6,000 to 7,000 to 9,000 vehicles per day).

The only effect that the different percentage of Johnson Ranch traffic has on identified improvements is that Ellsworth Road would need to have four lanes instead of two between Hunt Highway and Riggs Road in the year 2015, if 75 percent of Johnson Ranch traffic enters the study area instead of 50 percent (or 25 percent).

5. TRANSPORTATION SYSTEM ANALYSIS

The WATP travel demand model, discussed in Chapter 4 was used to forecast traffic volumes for 5, 10 and 20 years into the future. The traffic assignments were then analyzed to identify any deficiencies in the roadway network and to define transit service for all future scenarios. This chapter will discuss the evaluation criteria and results from the analysis and key transportation issues for the Williams Area. The next chapter will present the Transportation Plan for the Williams Area.

EVALUATION CRITERIA

Level of Service

Operating levels of service were developed to evaluate the transportation network in the Williams Area for each forecast year. LOS D is the acceptable operating LOS for arterial streets in urban areas. The development of threshold volumes for each level of service for both arterial streets and freeways is discussed in Chapter 2. The LOS threshold volumes are repeated in Table 5-1.

Table 5-1. LOS Guidelines for Average Daily Traffic Volumes

Roadway	Level of Service*				
	A	B	C	D	E
Arterial Streets					
2 lanes	8,000	11,000	14,000	16,000	17,000
4 lanes	17,000	24,000	27,000	32,000	33,000
6 lanes	26,000	37,000	42,000	48,000	51,000
Freeways					
4 lanes	29,000	46,000	69,000	87,000	98,000
6 lanes	43,000	69,000	103,000	130,000	153,000
8 lanes	58,000	92,000	138,000	174,000	204,000

* The traffic volumes shown under each LOS is the upper threshold volume providing that LOS.

Environmental and Other Constraints

In developing the transportation plan for the Williams Area, consideration needs to be given to several environmental issues. Many of the east-west roadways are not continuous through the study area. To connect or expand these roadway links will require building structures or bridges to cross the Roosevelt Water Conservation Canal and the Maricopa Floodway located adjacent to the east side of the canal. The Queen Creek Wash and the Powerline Floodway create similar problems. Although none of these obstacles preclude roadway construction, all present engineering challenges and additional costs in designing and constructing new roadway links to the roadway network. The Consolidated Canal and the Eastern Canal present similar challenges when widening existing roadway links.

Archaeological and historic sites are present on or adjacent to the Williams Gateway Airport/Williams Campus. The former Williams Air Force Base is on the National Priority List for Superfund sites. None of the archaeological or hazardous material sites are expected to preclude construction of roadways in the Williams Area. However, the exact locations of these sites in reference to individual project locations will need to be identified during the design process of any roadway improvement. A discussion of environmental features in the study area is presented in Chapter 2.

Completing Signal Butte Road and Pecos Road will require crossing the Southern Pacific Railroad tracks. This will present engineering and political challenges. New railroad crossings are expensive to build and maintain and can create possible safety and liability problems. Grade separated railroad crossings are relatively safe, however, they are very expensive and have a major impact on existing access to the roadway. A grade separated crossing can cost between one and two million dollars. At-grade railroad crossings are less expensive, costing approximately two to three hundred thousand dollars. However, even the best designed at-grade crossings have serious accident potential. The State Corporation Commission which controls railroad crossing locations is very reluctant to grant new at-grade crossings. The pros and cons need to be weighed when deciding between an at grade or grade separated crossing.

Because of these restrictions the railroad crossing at Signal Butte Road is not a high priority especially if Rittenhouse Road is reclassified as a collector street (to be discussed

later in this chapter). Pecos Road is vital to servicing the Williams Campus, therefore, a grade separated crossing would provide a complete roadway network and not strain the intersection of Williams Field Road and Power Road.

Currently Germann Road crosses the railroad tracks at an at-grade crossing near Sossaman Road. When Sossaman Road is constructed north of Rittenhouse Road this crossing will need to be modified. Some conceptual designs of the Sossaman Road/Germann Road intersection have Sossaman Road as a split roadway at Germann Road forming two tee-intersections with Germann Road.

Land Use

When developing a transportation plan it is necessary to ensure that the major employment generators are adequately served by the transportation system. The recommended roadway improvements to the Williams Area roadway network will improve access to the land uses within the study area and improve mobility for both employees and product transport. The majority of the major employment generators are industrial land uses located in a 24 square mile area bordered by Power Road, Mountain Road, Elliot Road and Pecos Road. Industries include Baker Rubber, General Motors, MGC Pure Chemicals, Olin Chemical, TRW Safety Systems, and the Williams Gateway Airport. Additional non-industrial major employers include the Williams Campus and the retail stores located on Power Road near US 60.

Because these routes provide access to US 60 and there are no continuous east-west roadways providing access to this industrial area, Ellsworth Road and Power Road currently handle the majority of the traffic, especially truck traffic. The completion of Meridian Road will improve access to MGC Olin, TRW, and Baker Rubber. Completion of Pecos Road and Ray Road will improve east-west travel to and from Baker Rubber, MGC, Olin, TRW, GM, and the WGA/Williams Campus. The completion of the Santan Freeway will improve access to and from the Regional Freeway System and the Interstate System for this industrial area.

TRAFFIC ASSIGNMENTS

WATP traffic assignments were generated for the years 1995, 2000, 2005, and 2015. The 1995 assignment was run with the existing street system. Years 2000 and 2005 assignments were run with the existing street system plus projects planned or programmed for completion in the next five years. The year 2015 assignment was run with the MAG 2015 network which included the Santan Freeway and a number of arterial streets which do not now exist.

Growth in traffic volumes can be shown by determining the volume of traffic that crosses various screen lines in the study area each year. The ten screen lines used to observe forecasted growth for the Williams Area are illustrated in Figure 4-1 in Chapter 4. Table 5-2 summarizes the screen line volumes for each year of traffic assignments. Traffic volumes increased across all screen lines for each future year. Substantial increases in traffic occurred between the year 2005 and the year 2015. The growth does not appear to be centralized in one section of the study area but does occur across the whole study area.

**Table 5-2. Screen Line Volumes
(Average Daily Traffic)**

Screen Line	Year			
	1995	2000	2005	2015 with Santan Freeway
1	8,000	12,000	23,000	38,000
2	13,000	24,000	33,000	79,000
3	12,000	21,000	31,000	60,000
4	17,000	33,000	46,000	116,000/75,000
5	22,000	49,000	65,000	69,000
6	47,000	83,000	101,000	193,000/135,000
7	25,000	53,000	78,000	131,000/97,000
8	10,000	26,000	40,000	113,000/56,000
9	36,000	49,000	66,000	79,000
10	73,000	104,000	116,000	202,000/144,000

Year 1995

The WATP traffic assignment generated for 1995 and the corresponding LOS for each roadway link is illustrated in Figure 5-1. All of the roadway links operate at LOS A or B. Therefore, no existing network deficiencies have been identified.

Year 2000

The year 2000 WATP traffic assignment and LOS are illustrated in Figure 5-2. Based on the currently programmed or planned roadway improvements, all roadways will operate at LOS C or better. Therefore, no roadway network deficiencies have been identified between 1995 and the year 2000. Table 5-3 lists all projects programmed or planned by the year 2000.

Table 5-3. Roadway Improvements Needed by Year 2000

Roadway	Project Area	Type of Work
Greenfield Road ¹	Guadalupe to Baseline	Widen from 2 to 4 lanes
Guadalupe Road ¹	Greenfield to Higley	Widen from 2 to 4 lanes
Arizona Avenue ²	Ocotillo to Queen Creek	Widen from 4 to 6 lanes
Gilbert Road ²	Germann to Queen Creek	Widen from 2 to 4 lanes
Greenfield Road ²	Warner to Guadalupe	Widen from 2 to 4 lanes
Higley Road ²	Baseline to Guadalupe	Widen from 2 to 6 lanes
Ellsworth Road ²	Baseline to Guadalupe	Widen from 2 to 4 lanes
Ellsworth Road ²	US60 to Baseline	Widen from 4 to 6 lanes
Guadalupe Road ²	Sossaman to Ellsworth	Construct 2 lanes
Riggs Road ²	Val Vista to Higley	Construct 2 lanes
Ray Road ³	Power to Sossaman	Construct 4 lanes
Sossaman Road ³	Ray to Williams Field Alignment	Construct 4 lanes

- 1 Projects planned by the Town of Gilbert
- 2 Currently programmed projects.
- 3 Projects planned by the Williams Gateway Airport.



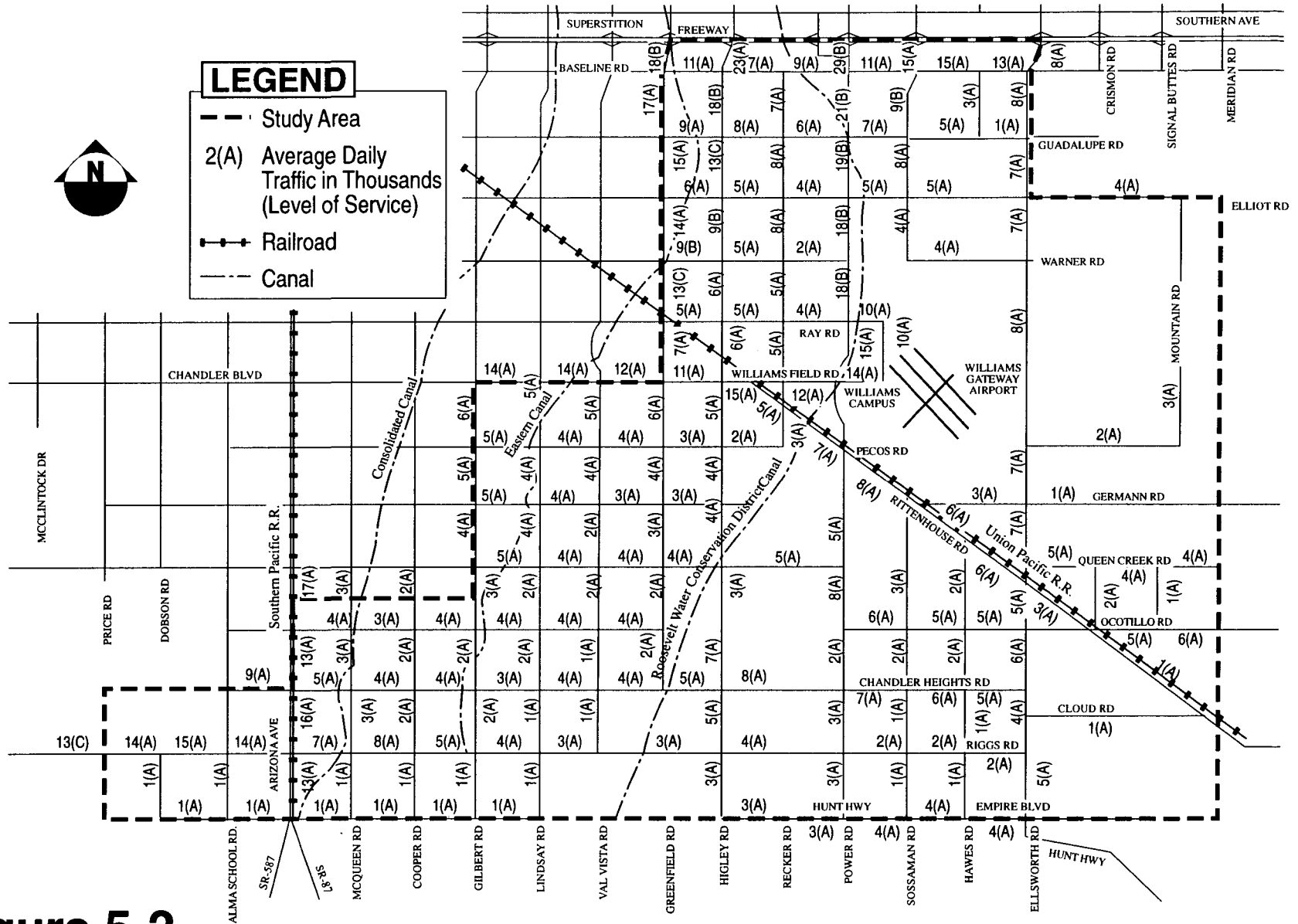


Figure 5-2
Year 2000 WATP Traffic Assignment and Level of Service

Year 2005

The year 2005 WATP traffic assignment and LOS are illustrated in Figure 5-3. Table 5-4 lists the needed roadway improvements to allow each link of the network to operate at LOS D or better. The only capacity improvement needed in the study area is the widening of Guadalupe Road between Recker Road and Higley Road from two to four lanes. However, outside the study area Riggs Road will need to be widened to four lanes between I-10 and Price Road. To improve access to Williams Campus and Williams Gateway Airport, Sossaman Road should be constructed as a four lane roadway between the Williams Field alignment and Pecos Road, and Pecos Road should be constructed as a two lane roadway between Power Road and Sossaman Road.

Table 5-4. Roadway Improvements Needed by the Year 2005

Roadway	Project Area	Type of Work
Guadalupe Road	Recker to Higley	Widen from 2 to 4 lanes
Pecos Road	Power to Sossaman	Construct 2 lanes
Sossaman Road	Williams Field Alignment to Pecos	Construct 4 lanes
Riggs Road*	Price to I-10	Widen from 2 to 4 lanes

* Borders study area.

Year 2015

The year 2015 WATP assignment was generated assuming completion of the Santan Freeway. Figure 5-4 illustrates the traffic assignment and LOS. Table 5-5 summarizes the roadway improvements necessary to allow all links of the roadway network to operate at LOS D or better for the year 2015 traffic. For this analysis new links added to the network (shown in Figure 4-3 in Chapter 4) were assumed to be two lanes when evaluating LOS. Table 5-5 includes those links that would operate at LOS E or F with two lanes and will need to be four lanes wide. It is likely that new links will be constructed as four lanes and will operate adequately.

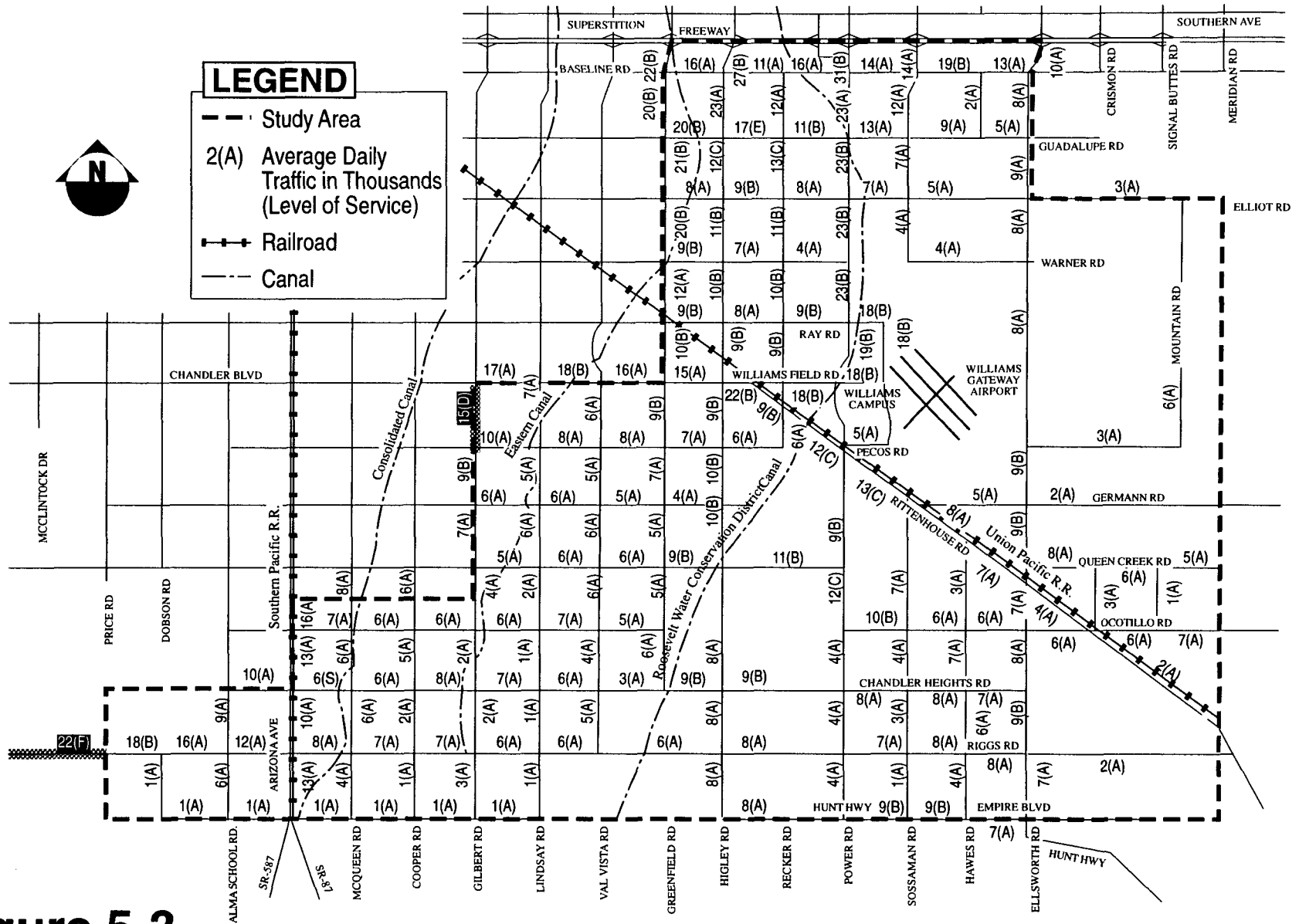


Figure 5-3
Year 2005 WATP Traffic Assignment and Level of Service



Table 5-5. Roadway Improvement Needed by the Year 2015

Roadway	Location	Type of Work
Val Vista Road	Germann to Williams Field	Widen 2 to 4 Lanes
Higley Road	Williams Field to Guadalupe	Widen 2 to 4 Lanes
Power Road	Queen Creek to Pecos	Widen 2 to 4 Lanes
Sossaman Road	Ray to Warner	Widen 2 to 4 Lanes
Ellsworth Road	Chandler Heights to Germann	Widen 2 to 4 Lanes
Ellsworth Road	Pecos to Elliott	Widen 2 to 4 Lanes
Elliott Road	Hawes to Ellsworth	Widen 2 to 4 Lanes
Ray Road	Greenfield to Higley	Widen 2 to 4 Lanes
Pecos Road	Power to Sossaman	Widen 2 to 4 Lanes
Germann Road	Gilbert to Lindsay	Widen 2 to 4 Lanes
Germann Road	Val Vista to Greenfield	Widen 2 to 4 Lanes
Rittenhouse Road	Williams Field to Recker	Widen 2 to 4 Lanes
Rittenhouse Road	Power to Ellsworth	Widen 2 to 4 Lanes

TRANSPORTATION ISSUES

Santan Freeway

The Santan Freeway is part of the Regional Freeway Plan. To determine the impact that the Santan Freeway has on the Williams Area roadway network, a year 2015 WATP assignment was run assuming that the Santan Freeway ended at Arizona Avenue. The year 2015 WATP assignment and LOS is illustrated in Figure 5-5. The roadway improvements needed for each roadway link to operate at LOS D or better is summarized in Table 5-6. As before for analysis purposes, new links were assumed to be two lanes when evaluating LOS.

The differences in the deficiencies in the roadway network with and without the Santan Freeway can be observed by comparing Tables 5-5 and 5-6. Without the Santan Freeway, eleven more miles of arterial streets will need to be widened (from 25 to 36 miles). Sections of Warner Road, Ray Road, and Pecos Road, that otherwise would not need widening, will need widening if the Santan Freeway is not constructed. With the Santan Freeway, additional sections of Ellsworth will need to be widened. The arterial streets on both sides of Santan Freeway traffic interchanges will also need to be widened.

**Table 5-6. Roadway Improvements Needed by the Year 2015
(Without Santan Freeway)**

Roadway	Project Area	Type of Work
Gilbert Road	Germann to Pecos	Widen from 2 to 4 lanes
Lindsay Road	Pecos to Williams Field	Widen from 2 to 4 lanes
Val Vista Drive	Pecos to Williams Field	Widen from 2 to 4 lanes
Greenfield Road	Williams Field to Ray	Widen from 2 to 4 lanes
Higley Road	Williams Field to Guadalupe	Widen from 2 to 4 lanes
Higley Road	Baseline to US 60	Widen from 5 to 6 lanes
Power Road	Queen Creek to Pecos	Widen from 2 to 4 lanes
Sossaman Road	Ray to Baseline	Widen from 2 to 4 lanes
Ellsworth Road	Chandler Heights to Germann	Widen from 2 to 4 lanes
Ellsworth Road	Pecos to Ray	Widen from 2 to 4 lanes
Ellsworth Road	Elliot to Guadalupe	Widen from 2 to 4 lanes
Warner Road	Greenfield to Recker	Widen from 2 to 4 lanes
Ray Road	Greenfield to Power	Widen from 2 to 4 lanes
Pecos Road	Gilbert to Higley	Widen from 2 to 4 lanes
Pecos Road	Power to Sossaman	Widen from 2 to 4 lanes
Germann Road	Gilbert to Lindsay	Widen from 2 to 4 lanes
Ocotillo Road	Arizona to McQueen	Widen from 2 to 4 lanes
Rittenhouse	Williams Field to Ellsworth	Widen from 2 to 4 lanes

The completion of the Santan Freeway will have an impact on travel times from the Williams Gateway Airport. The Santan Freeway will allow a vehicle to connect to the US 60/Sossaman Road traffic interchange approximately three minutes faster (12 minutes versus 15 minutes), to the US 60/Santan freeway system interchange 8 minutes faster (11 minutes versus 19 minutes), and to the Price Freeway/Santan Freeway system interchange 15 minutes faster (19 minutes versus 34 minutes) than using the arterial street network. In addition, the construction of the Santan Freeway will have a positive impact on air quality in the region. The completion of the Santan will have a positive impact on the development of the Williams Area and thus is recommended in the Williams Area Transportation Plan.

Hawes Road Interchange

Daily forecast traffic volumes downstream of the Warner Road/Santan Freeway interchange are 12,000 less on the westbound Santan Freeway and 11,000 more on the

eastbound Santan Freeway than upstream volumes. This is the largest change in traffic along the Santan Freeway. Forecasts of 13,000 westbound vehicles exiting at the Warner Road interchange and 11,000 eastbound vehicles entering at the Warner Road interchange could cause mainline operational problems. These volumes are equivalent to the traffic volumes currently exiting and entering the Superstition Freeway at interchanges between Loop 101 and Country Club Drive. These high volumes will also deteriorate operation of traffic signals at nearby intersections on the arterial street network. It would be beneficial for these ramp volumes to be split between two traffic interchanges.

At the two intersections adjacent to the interchange, Warner Road/Sossaman Road and Warner Road/Ellsworth Road, a large amount of traffic is making a left turn movement. At Warner Road and Ellsworth Road, a heavy northbound to westbound left turn movement is expected. At Warner Road and Sossaman Road, a heavy westbound to southbound movement is expected. Left turn operations are expected to operate poorly at these intersections. Queuing problems could occur at the intersections as well as at the traffic interchange. Therefore, the Hawes Road traffic interchange would be beneficial to the arterial street network for better distribution of freeway bound traffic.

In addition, an interchange at Hawes Road would improve service to the relocated Williams Gateway Airport terminal (near Ellsworth Road). Under the current interchange concept, vehicles will have to travel about three miles on arterial streets to reach the freeway. With a Hawes Road interchange, this distance will be reduced to less than one mile—a major benefit for airport users. The Williams Area Transportation Plan thus recommends the construction of an interchange between Hawes Road and the Santan Freeway.

Rittenhouse Road

Rittenhouse Road is to the southeast valley what Grand Avenue is to the northwest valley, a diagonal arterial running parallel to railroad tracks in an otherwise mile-grid system of arterial streets. Today, Rittenhouse Road operates fine as Grand Avenue did years ago. However, in the future, Rittenhouse Road will create the same problems that Grand Avenue does today. In fact, the year 2015 forecast volumes on Rittenhouse Road are approaching today's traffic volumes on Grand Avenue in the 59th Avenue area.

To evaluate the impact of eliminating Rittenhouse Road as an arterial street, a WATP traffic assignment was run for the year 2015 without Rittenhouse Road (Figure 5-6). The elimination of Rittenhouse Road has little impact on the transportation network other than slightly increased traffic volumes on adjacent roadways. The biggest impact would be on Germann Road between Higley Road and Val Vista Road. The roadway would need to be widened from two to four lanes without Rittenhouse Road. The elimination of Rittenhouse Road as a through route would prevent the need to widen Rittenhouse Road to four lanes west of Ellsworth Road. Thus, there appears to be little traffic service impact of eliminating Rittenhouse Road.

From an operational standpoint the abandonment of Rittenhouse Road would eliminate the six legged intersection with Germann Road and Sossaman Road. A six legged intersection experiences increased delay for all vehicles versus a four legged intersection because of the need for a 12 phase signal operation. The extra idle time will cause more air pollution. The six-legged intersections of 27th Avenue/Thomas Road and 35th Avenue/Indian School Road with Grand Avenue are air pollution "hot spots" in the valley.

At other intersections, the train tracks and the small acute angles formed between Rittenhouse Road and the intersection arterial create traffic operational problems and make signing and signal operations difficult. The signal cycle needs to be adjusted when a train passes through the intersection and right turns need to be prohibited for northbound travel (i.e., special signing).

On the other hand, current travel patterns and land development plans have been predicated on Rittenhouse Road. For example, the elimination of Rittenhouse Road would require Queen Creek residents to use Ocotillo Road and Power Road to access the WGA/Williams Campus area until more roadway connections are constructed. The *October* 1996 Queen Creek General Plan classifies Rittenhouse Road as a major arterial street.

To account for these factors, the William Area Transportation Plan recommends that Rittenhouse Road be reclassified from an arterial street to a collector or local street west of Power Road and that it remain an arterial, in concert with Queen Creek plans east of Power Road. Rittenhouse Road should tee into Power Road.

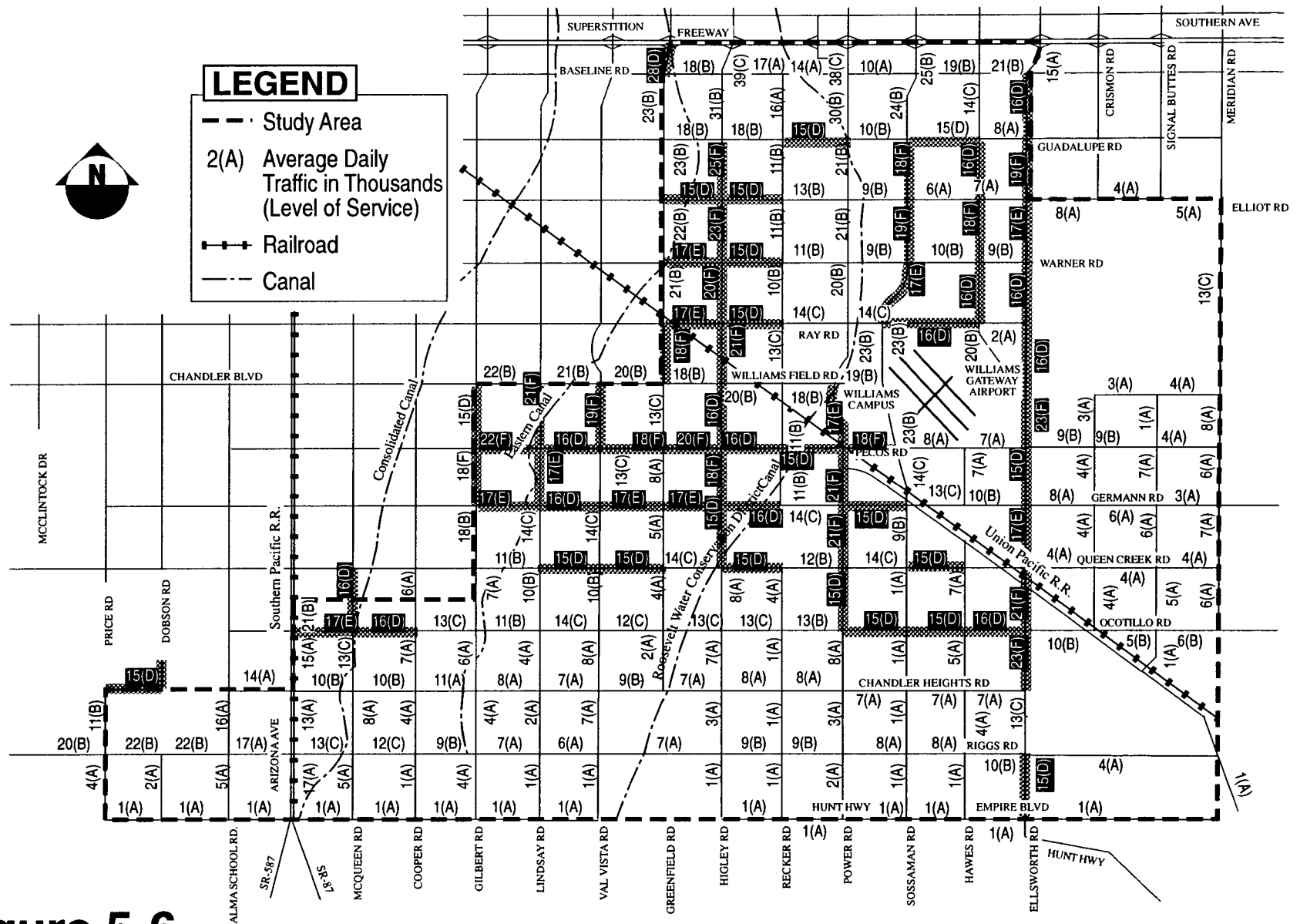


Figure 5-6

Year 2015 without Rittenhouse Road WATP Traffic Assignment and Level of Service

Key Roads

As part of the Comprehensive Land Use Plan and the accompanying Northeast, Southwest, and Southeast Maricopa County transportation plans, the County is asking that key roads in each area be identified. The key roads identified in the Williams Area are shown in Figure 5-7 and are discussed below:

- Queen Creek and Riggs Road are identified as key roads because of their connection to traffic interchanges on I-10.
- Williams Field Road provides a connection from the Santan Freeway to the Williams Campus.
- Because of the Williams Gateway Airport, there are no continuous north-south streets between Ellsworth Road and Power Road—a distance of three miles. Therefore Ellsworth and Power Roads are key roads in Southeast Maricopa County.
- Hawes Road will provide access from the Santan Freeway to the relocated Williams Gateway Airport Terminal.

Alternative Modes

The Phoenix metropolitan area has developed primarily since the 1950's, thus growth has occurred in a dominate automobile environment. Therefore, the primary mode of transportation in the Valley has been, and will continue to be, the private automobile. However, because of the ASU East campus and Williams Gateway Airport location in the southeast corner of the Valley where the large majority of the traffic will be coming from the north or the west, it will be important to provide alternative modes of transportation to the area. In this section, the potential of alternative modes to the private automobile is discussed. The alternative modes of travel may delay roadway improvements by one to two years but the improvements will still be needed.

Bus Transit

The transit service needs in the study area are related to the mode split for transit, the density of employment and population in the study area, and to connections to a larger transit network in the metropolitan area.

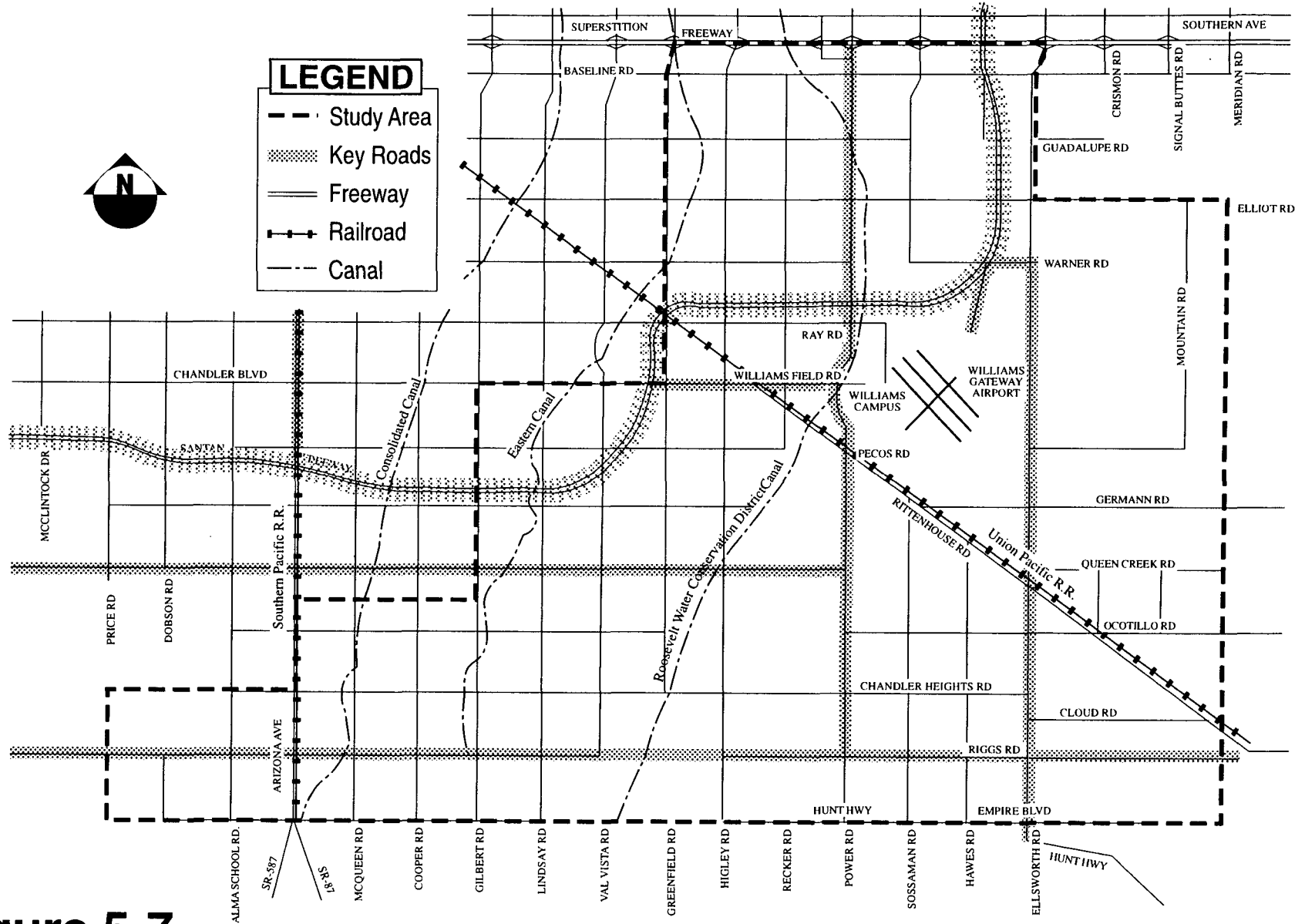


Figure 5-7
Key Roads

The current overall mode split for transit is about one percent in the Phoenix metropolitan area. The transit network, especially in the suburban areas, is limited. The limited network affects the overall viability of transit, resulting in the low mode split. The density and development patterns also impact the mode split for transit. Although the study area has some activity centers with a high concentration of employment or student activity, overall densities are the relatively low ones found in suburban areas. Development is geared to the automobile, the dominant mode of travel.

The relationship between travel mode and land use is strong. As this area is just developing, there is an opportunity to incorporate transit-friendly development standards. This will make the area easier to serve by transit and reduce barriers to pedestrian travel, a necessary part of the transit trip. Although this study addresses transportation issues, the William's Gateway Airport Authority may wish to consider linkages to land use planning and development standards in order to support their transportation goals. The land use which is planned includes major activity centers which can be effectively served by the transit mode, including the employment and student markets. It is reasonable to anticipate a two percent or greater overall mode split with a comprehensive transit network and appropriate development standards. The mode split for certain markets and in certain corridors will be higher.

Approach to Transit Service Analysis

Two basic sets of data were used to determine the transit needs.

1. Average daily traffic volumes on study area roadways from the traffic model.
2. Socioeconomic data indicating the densities of population and employment.

Traffic Volumes

The projected average daily traffic volumes were used to determine the overall flow of traffic and identify route coverage patterns. The model runs which included the Santan Freeway were used in this exercise.

Density of Employment and Population

Density of both employment and population are key indicators of where transit service can be effective. Rather than dealing with each separately, the number of residences

and employees can be combined to form a composite index. Figure 5-8 illustrates the projected density of employees and residents in the year 2005 and Figure 5-9 illustrates the densities in the year 2015. The densities are presented in persons and employees per acre. The number of persons per acre and per square mile and the sort of transit services that are appropriate for each range of densities are shown in Table 5-7. Although these guidelines have not been used in the Phoenix metropolitan area, RPTA is aware of them. The values are based on a study of service levels in New York State and are standards used by the Regional Transportation District in Denver, Colorado and by the Orange County Transit Authority in California.

The maps of the projected densities of population and employment indicate a solid core of 6 to 9 persons per acre along the Rittenhouse Road corridor, and in the northeast quadrant of the study area between Greenfield Road and Power Road. Within this area there are a few areas where densities are between 9 and 12 persons per acre.

Table 5-7. Range of Bus Services by Density of Development

Persons and Employees per Acre	Persons and Employees per Square Mile	Appropriate Services
Less than 3.0	Less than 1,900	Carpool, Vanpool
3.0 to 5.9	1,900 to 3,800	Peak Hour Express, Route Deviation, Limited Fixed Route, depending on activity centers.
6.0 to 8.9	3,800 to 5,800	Local fixed route bus, often with 60 minute frequencies. Increases in frequency and coverage based on ridership. Also, peak hour express bus.
9.0 to 11.9	5,800 to 7,700	Local fixed route with 30 minute frequencies.

Note: This table represents a general guideline for services. The type of transit service an area will support depends on several factors, including distances between trip generators and attractors, demographics of the population, geography, and development characteristics. Ridership is the defining characteristic and will indicate if service frequency or coverage (the spacing of the routes) can be increased.

Source: Transit Plus

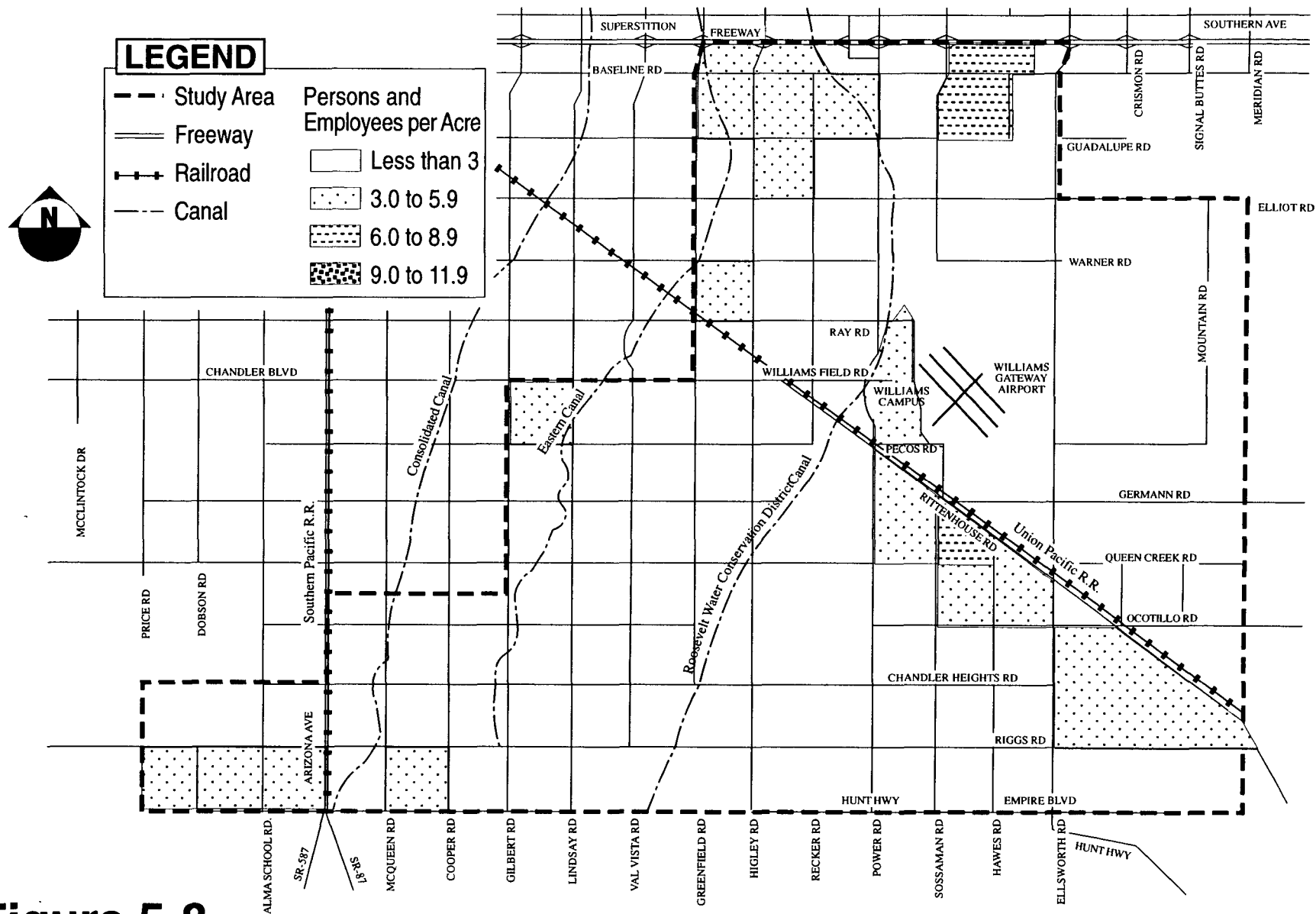


Figure 5-8
Year 2005 Population and Employment Density

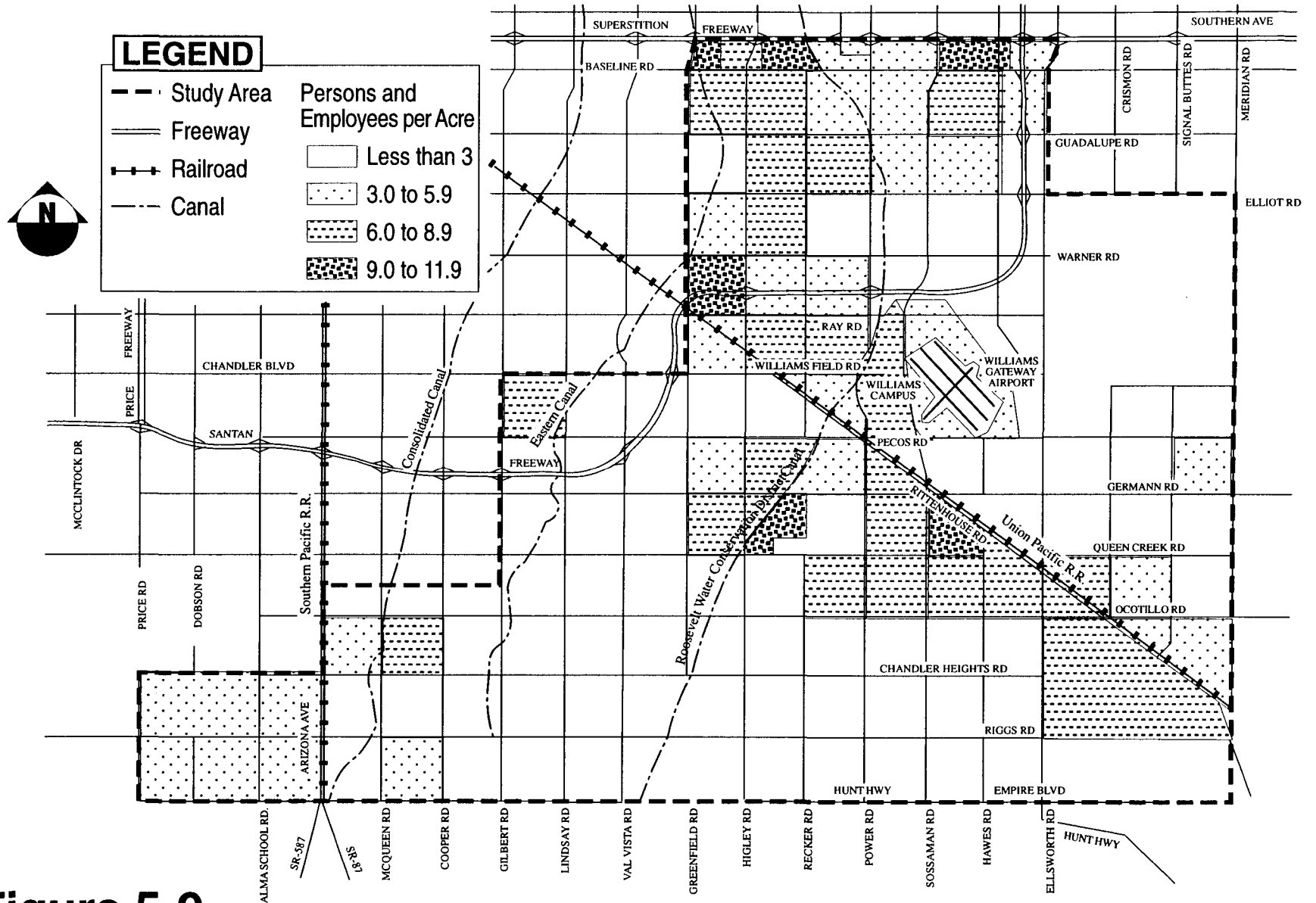


Figure 5-9
Year 2015 Population and Employment Density

Rail Transit

While Table 5-7 does not include commuter rail, the densities along Rittenhouse Road may support such service. An important factor will be the location of the employment for residents in this area and the location of residences for employees and students in the study area. If these trips can be effectively served by a rail line, the potential for success is high.

Rail transit has been considered a number of times in the Valley over the years. As this report is being written MAG is preparing a study on rail transit in the East Valley. The existing rail line along Rittenhouse Road provides excellent access from the Williams Gateway Airport/Williams Campus to the main ASU campus in Tempe, to Sky Harbor International Airport, to downtown Phoenix, and to the westside communities along Grand Avenue. The Williams Campus Master Plan includes a spur line from the main track to a future commuter rail station on Pecos Road. If rail transit service is ever developed in the region, the WGA/Williams Campus area could certainly be a major transit and destination point for people and cargo. Therefore, it is important to keep this option open by preserving right-of-way for a future spur and rail station. However, if this spur is developed a grade separation where the rail line crosses Power Road would be desirable for safety and operational reasons. The Queen Creek Town Center Plan includes a commuter train station. Any future passenger service to Williams Gateway Airport/Williams Campus should include a terminal at this station.

The Williams ReUse Plan also includes a freight spur into the airport. Currently, no tenant at WGA has expressed the need for rail service but the need in the future is a possibility. An evaluation of the need or feasibility of this freight spur is beyond the scope of this study, however, the option should be retained. The primary issue would seem to be the desirability of maintaining and increasing freight hauling on a rail line which would also be providing commuter service.

Peak hour bus services can help build ridership in this corridor and can be used as a gauge of potential rail ridership. Commuter rail, however, has a significant advantage over bus service in that travel times are generally much shorter on commuter rail since the trains

operate on rails and are not hampered by traffic congestion. As a result, ridership levels on commuter rail can be significantly higher than on express buses.

The transit system recommended for the Williams Area is discussed in Chapter 6.

Ridesharing

Carpooling would seem to be a real option for many employees in the Williams Gateway Airport and Williams Campus area. A regional rideshare program has been in operation since 1973. It is currently being operated by the Regional Public Transportation Authority. Although, based upon 23 years of experience with car and van pooling, it is not realistic to expect ridesharing to eliminate the need for roadway improvements in the Williams Area, it would be desirable for the Williams Gateway Airport and Williams Campus to continue participating in the trip reduction program of the region.

Bicycles

As ASU East grows, bicycle traffic will increase along with the student population. Although no survey data is available, the City of Tempe recognizes that bicycling is a major mode of transportation around the ASU Main campus with bicycles seemingly outnumbering cars on some streets around the campus. Not surprisingly, the highest number of bicycle accidents in Tempe is also around the campus. As the street system develops around ASU East, it will be important to provide safe bicycle facilities.

In 1992, MAG adopted a Regional Bicycle Plan. Power Road, Williams Field Road, Guadalupe Road, Rittenhouse Road, and Lindsay Road are all on the regional system. In accordance with the Plan, bicycle lanes will be provided on these four roadways. As part of the Williams Area Transportation Plan it is recommended that bicycle lanes be provided on all arterial streets in the study area. Since all surrounding cities and towns include bicycle lanes on their arterial streets, this will provide uniformity throughout the southeast Valley.

Major access points to the campus are being planned from Power Road at Williams Field Road, off of Pecos Road, and off of Sossaman Road. As these roads are being improved, bicycle lanes should be designed and constructed in accordance with the most current AASHTO and Arizona Bicycle Task Force design guidelines.

Pedestrians

Pedestrian activity in the Williams Area will, as with bicycling, be the heaviest around the ASU East campus. As the campus develops it will be important to design so that pedestrian access points to the campus are at intersections controlled by traffic signals to minimize safety problems associated with students crossing at unprotected locations.

Elsewhere in the Williams study area, sidewalks should be provided along arterial streets to provide for pedestrian activity.

Vehicle Mix

Due to the large amount of industry in the Williams Area, all roads need to be designed to carry truck traffic. Development at the Williams Gateway Airport is expected to increase truck traffic on the roadway network. A petroleum supplier has expressed interest in using the petroleum pipeline connection and fuel storage facilities at the airport to establish a terminal for the distribution of aviation fuels throughout the region. The airport is also expected to expand air cargo operations. Table 5-8 summarizes the amount of cargo and fuel expected to be handled at the airport each day.

Table 5-8. Daily Cargo and Fuel Operations

	Year 2000	Year 2005	Year 2015
Cargo			
Flights/Day	11	13	21
Tons/Flight	4.2	4.6	5.1
Tons(Pounds)	46(92,000)	60(120,000)	107(214,000)
Fuel			
Gallons/Day	100,000	100,000	100,000

Source: Williams Gateway Airport Authority

There are 13 classifications of trucks in Arizona. The majority of registered trucks fall in the smallest weight category and average 26,000 pounds. The Williams Airport Master Plan projects that approximately 13,500 tons of cargo/mail could be enplaned annually by the year 2015. This amount represents approximately 20 percent of the air cargo

projections for Phoenix Sky Harbor. Current discussions indicate air cargo operations will most likely be bulk cargo. Therefore, it is likely that the majority of the trucks generated by the Airport will be single unit trucks. Approximately 100 trucks per day are expected to be generated by the airport cargo operations. Fuel trucks can carry a maximum of 8,000 gallons of fuel in Arizona. Therefore only 10-12 fuel trucks are expected each day to handle the fuel operations at the airport. For safety concerns, the truck traffic should be separated from the campus traffic as much as possible. This makes the completion of Sossaman Road, Pecos Road and Ray Road adjacent to the airport important to the safety of the students of the Williams Campus.

6. TRANSPORTATION PLAN AND IMPLEMENTATION

The Williams Area Transportation Plan presented in the chapter is based on the traffic analysis presented in Chapter 5. Following a discussion on the roadway design guidelines for arterial streets the Plan is presented. This is followed by a discussion on implementation.

UNIFORM ROADWAY GUIDELINES

To ensure that the arterial street network in the Williams Area is safe and carries its potential capacity, it is necessary to have standard cross-sections for the roadway network. For the Williams Area it is recommended that the arterial streets, both major and minor, have 130 foot right-of-way preserved. This will allow seven-lane cross sections with bicycle lanes and sidewalks to be constructed on any arterial street in the future if traffic so warrants (Figure 6-1). Traffic lanes should be 12 feet wide. The arterial streets should be divided with either a raised median or two way left-turn lane. Raised medians should be provided within 660 feet of the intersections on all approaches. Full median breaks should be spaced at a minimum of 660 feet and partial median breaks should be spaced at 330 feet. Driveway spacing should be limited to 220 feet. Signal spacing should be limited to 1/4 mile spacing. Half mile or mile spacing would be preferable to optimize signal timing. Table 6-1 summarizes the recommended roadway guidelines for the Williams Area.

Table 6-1. Recommended Arterial Roadway Guidelines

		Chandler	Gilbert	Mesa	Maricopa County	Queen Creek	Recommended Williams Area
Number of Lanes		6	6	6	4-6	6	6
Right-of-Way		130 feet	130 feet	130 feet	130 feet	130 feet	130 feet
Median Type		Raised	Raised	Varies	Raised	Raised	Raised/Striped
Median Break	Full*	660 feet	660 feet	660 feet			660 feet
Spacing	Partial*		330 feet	330 feet			330 feet
Access Point Spacing*		100 feet	220 feet	60 feet	105 feet		220 feet
Signal Spacing*		1/4 mile	1/4 mile	1/4 mile	1/4 mile		1/4 mile

* Minimum spacing.

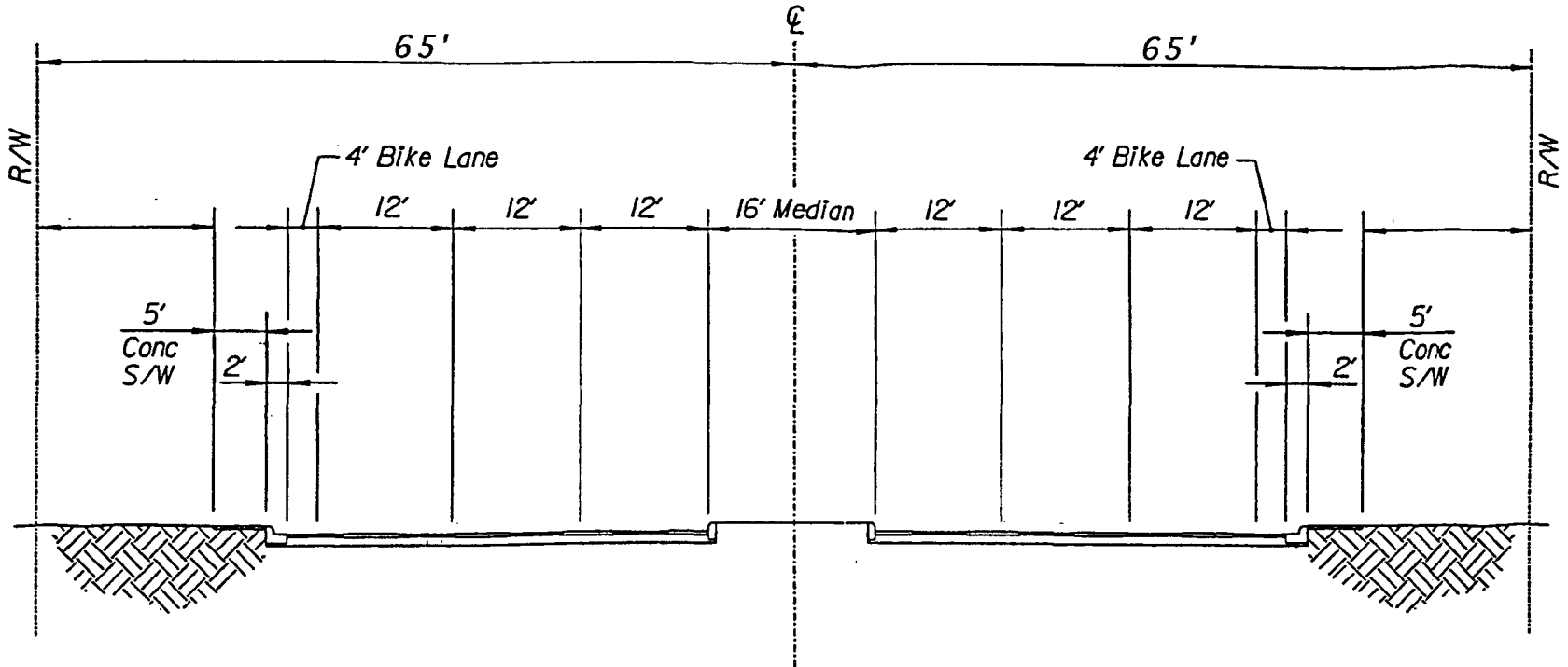


Figure 6-1
Typical Roadway Section - Ultimate 6 Lane Arterial Street

At the intersection of two arterial streets, right-of-way should be reserved for dual left turns, three through lanes, and an exclusive right-turn lane for all approaches. The right-of-way requirements would be 140 feet for a distance of 630 feet from the center of the intersection for all approaches.

As the Williams Area develops, 130 feet of right-of-way should be preserved on all arterial street alignments.

WILLIAMS AREA TRANSPORTATION PLAN

General Recommendations

The Williams Area Transportation Plan deals primarily with the arterial street system and with bus transit in the study area. The collector and local street system will be designed to current city and county standards as development occurs, therefore it is not dealt with in this Plan.

In addition the following recommendations, detailed in Chapter 5, are key elements of the Plan:

- **Santan Freeway:** To improve access and mobility in the study area, the Santan Freeway should be constructed.
- **Hawes Road Traffic Interchange:** To provide improved access to the Williams Gateway Airport terminal when it is relocated east of the runways, a Hawes Road traffic interchange should be constructed on the Santan Freeway.
- **Rittenhouse Road:** To eliminate future operational problems caused by having a diagonal street traversing a grid system, Rittenhouse Road should be reclassified from an arterial street to a local or collector street west of Power Road. Rittenhouse Road should "tee" into Power Road. East of Power Road, Rittenhouse Road remains an arterial street in concert with Queen Creek's General Plan. Efforts should be made to avoid six-legged intersections east of Power Road.
- **Pecos Road:** Public input received during the planning process indicated a desire to keep the alignment of Pecos Road south of Williams Gateway Airport flexible. This flexibility is consistent with the WATP. The exact alignment will be established during roadway design.
- **Rail Service:** The potential to implement a commuter rail service within the existing rail corridor for this area should be considered as a high priority. It is recommended that the option for rail service connecting Queen Creek, Williams Gateway Airport and Williams Campus to the main campus of ASU, Sky Harbor International Airport, downtown Phoenix, and points outside of the metropolitan

area using the existing rail line be explored. A rail service for passengers and cargo with a Sky Harbor destination and students traveling to ASU main campus could be developed into a major transportation corridor. Coordination with the surrounding communities and with MAG to implement this project will need to occur. Figure 6-2 illustrates a possible commuter corridor serving the Williams Area.

Roadway Element

The roadway element of the Williams Area Transportation Plan is developed in this section by building upon the existing system and identifying improvements needed in the 5, 10, and 20 year time frames.

5 Year Transportation Plan

The 5 Year Williams Area Transportation Plan (WATP) includes the current projects programmed in the Maricopa Association of Governments' Transportation Improvement Program for 1996-2000. In addition, the planned improvements by the WGA on Ray Road and Sossaman Road should be included. The widening of Greenfield Road, between Guadalupe Road and Baseline Road from two to four lanes, is planned by the Town of Gilbert and should also be included. Figure 6-3 illustrates the resulting number of lanes for each arterial street in the Williams Area for the 5 Year WATP. The 5 Year WATP should be completed by the year 2000. Table 6-2 summarizes the needed roadway improvements to complete the 5 Year Plan.

10 Year Transportation Plan

The 10 Year Williams Area Transportation Plan incorporates all parts of the 5 Year WATP with several additions. To improve access to the Williams Area, Riggs Road needs to be widened from 2 to 4 lanes between I-10 and Price Road. Another addition is the widening of Guadalupe Road between Recker Road and Higley Road. Maricopa County is planning on widening Ellsworth Road between Guadalupe Road and Germann Road to four lanes in year 2001.

To improve access to the Williams Campus and Williams Gateway Airport portions of Sossaman Road and Pecos Road need to be constructed and Power Road needs to be widened to Pecos Road. Figure 6-4 illustrates the resulting number of lanes for each arterial

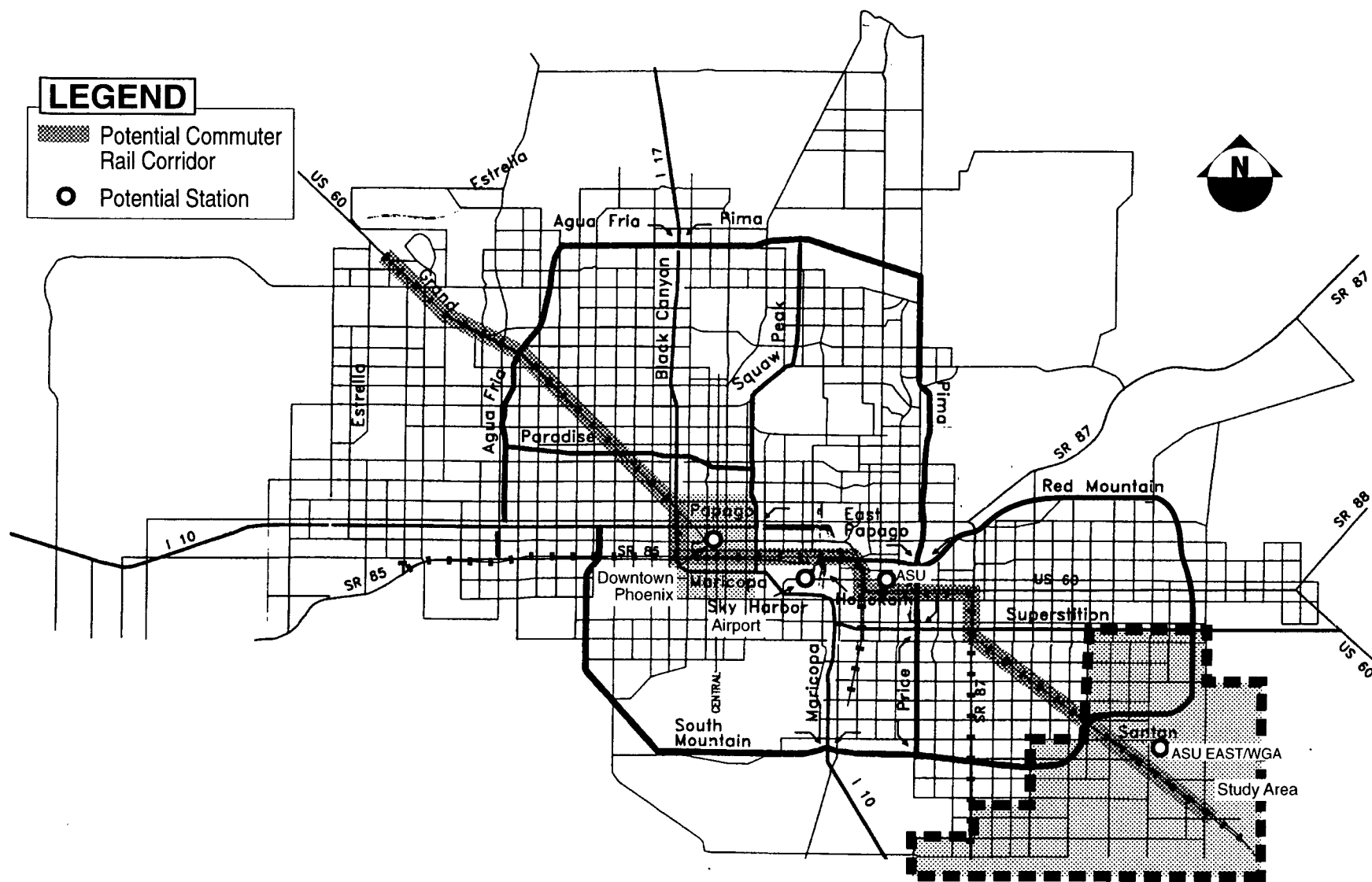


Figure 6-2
Potential Commuter Rail Corridor

Table 6-2. Projects for the 5 Year WATP

Jurisdiction	Roadway	Project Area	Type of Work	Miles	Estimated Cost ¹ (\$)
Gilbert	Greenfield Road ²	Guadalupe to Baseline	Widen from 2 to 4 lanes	1.0	\$ 1,000,000
Chandler	Arizona Avenue ³	Ocotillo to Pecos	Widen from 4 to 6 lanes	3.0	7,000,000
Chandler	Gilbert Road ³	Germann to Queen Creek	Widen from 2 to 4 lanes	1.0	1,650,000
Gilbert	Greenfield Road ³	1/2 S of Warner to Guadalupe	Widen from 2 to 4 lanes	2.5	2,975,000
Gilbert	Higley Road ³	Baseline to Guadalupe	Widen from 2 to 6 lanes	1.0	1,500,000
Mesa	Ellsworth Road ³	Baseline to Guadalupe	Widen from 2 to 4 lanes	0.5	300,000
Mesa	Ellsworth Road ³	US60 to Baseline	Widen from 4 to 6 lanes	0.5	300,000
Mesa	Guadalupe Road ³	Sossaman to Ellsworth	Construct 2 lanes	2.0	1,200,000
Maricopa County	Riggs Road ³	Val Vista to Higley	Construct 2 lanes/ bridge	2.0	2,600,000
Mesa	Ray Road ⁴	Power to Sossaman	Construct 4 lanes/bridge	1.0	6,000,000
Mesa	Sossaman Road ⁴	Ray to Williams Field	Construct 4 lanes	1.0	Part of project above
Mesa	Guadalupe Road ³	Power to Sossaman	Widen from 2 to 3 lanes	1.0	600,000
Chandler	Riggs Road ³	Arizona Avenue to 1/2 mile East	Widen from 2 to 4 lanes	0.5	330,000
Gilbert	Elliot Road ³	156th St to 164th St	Widen from 2 to 4 lanes	1.0	1,000,000
Gilbert	Recker Road ³	Houston to Guadalupe	Widen from 2 to 4 lanes	0.5	400,000
Mesa	Power Road ³	Kiowa Ave to Guadalupe	Widen from 4 to 5 lanes	0.75	450,000
Gilbert	Guadalupe Road ⁵	Greenfield to Higley	Widen from 2 to 4 lanes	1.0	1,500,000
Mesa	Sossaman Road ³	Guadalupe to Monterey Ave	Widen from 2 to 4 lanes	0.25	150,000
Mesa	Sossaman Road ³	Superstition Spgs Blvd to Baseline	Widen from 4 to 5 lanes	0.25	150,000
Total:					\$29,105,000

- 1 Estimated costs for non-programmed projects are based on average cost per mile lane for all programmed projects in the Williams Area and exclude right-of-way costs.
- 2 Projects planned by the Town of Gilbert.
- 3 Currently programmed projects.
- 4 Projects planned by the Williams Gateway Airport.
- 5 A portion of this project is currently programmed. The remainder is planned by the Town of Gilbert.

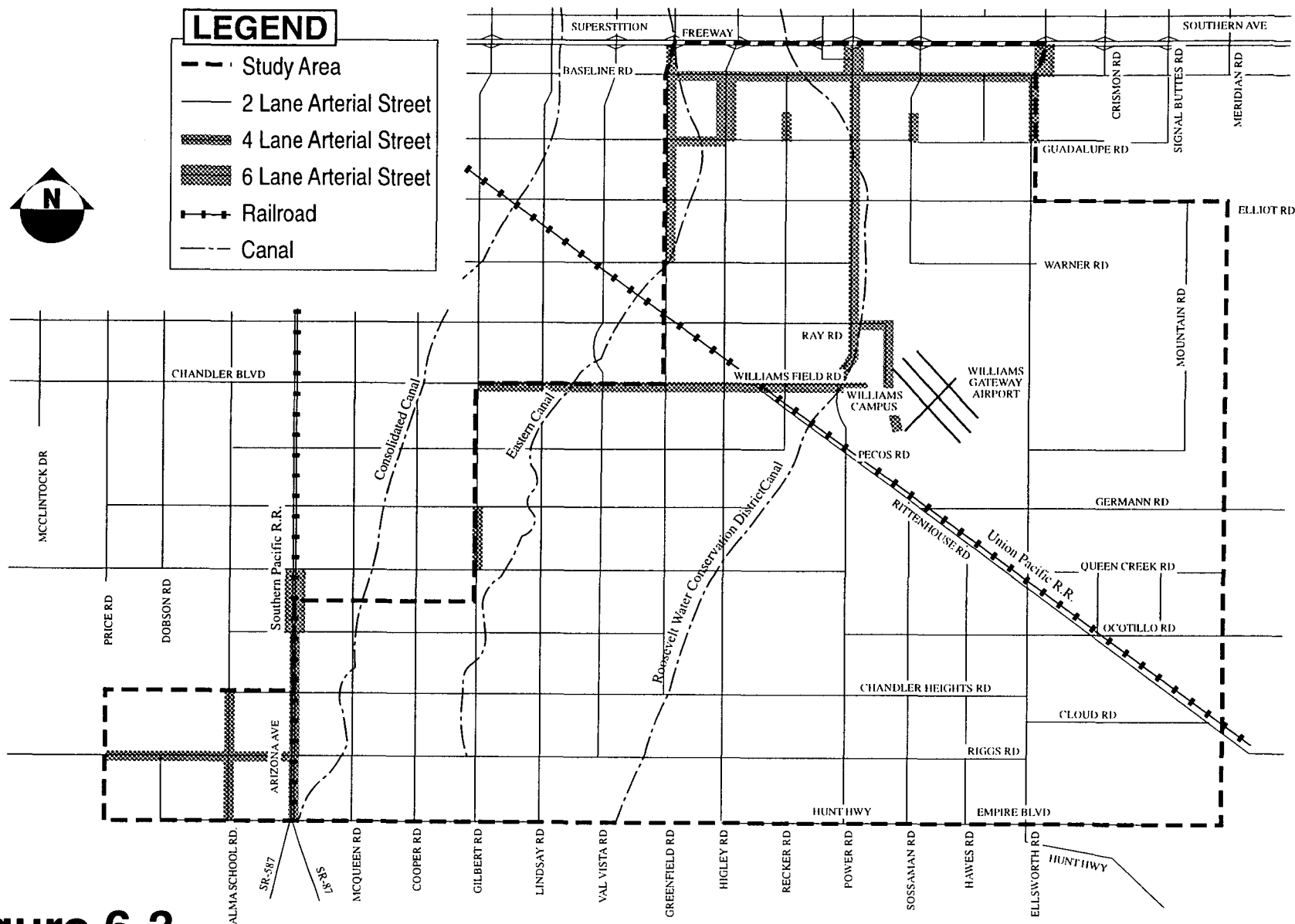


Figure 6-3
Five Year WATP

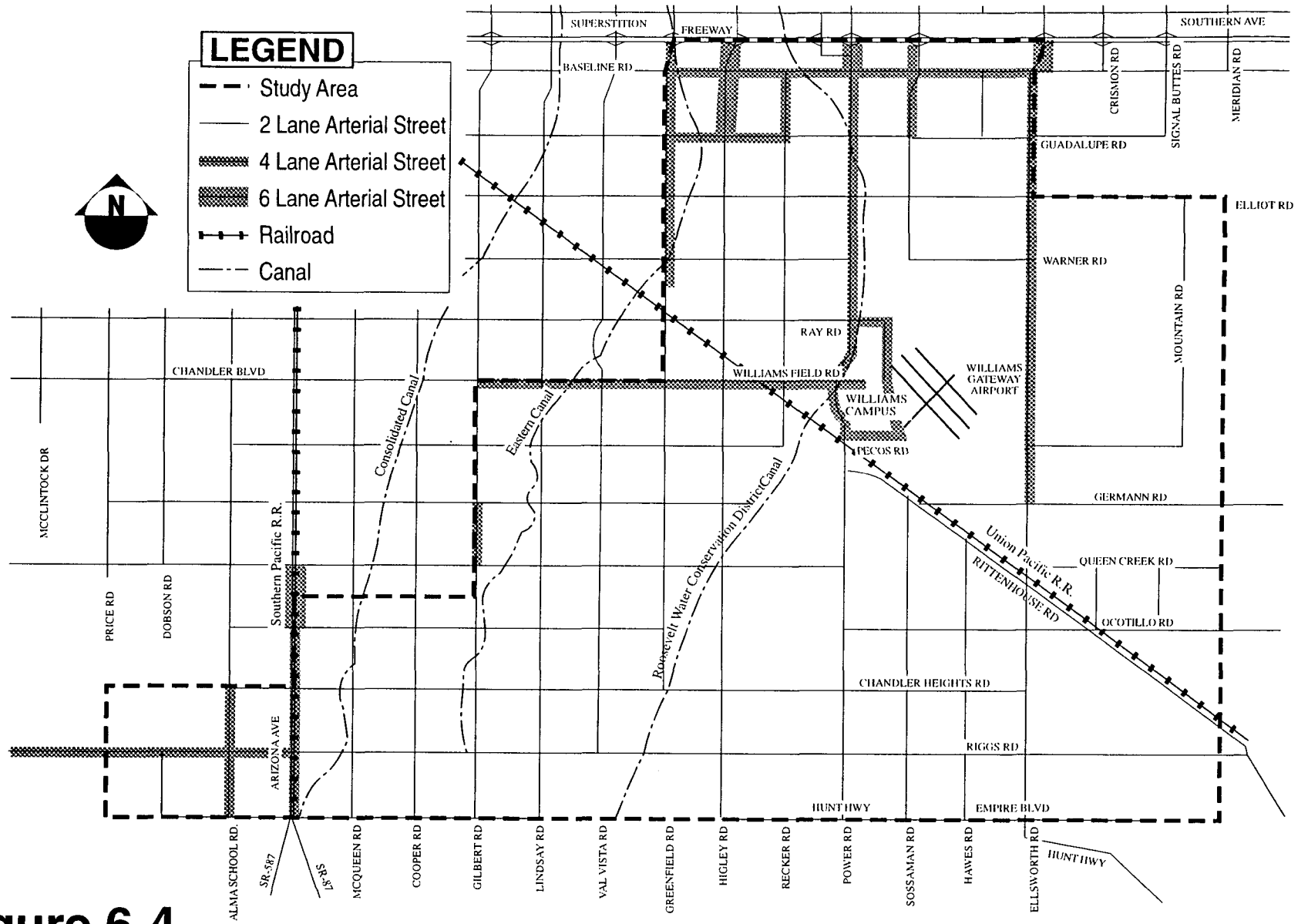


Figure 6-4
Ten Year WATP

street in the Williams Area for the 10 Year WATP. With the extension of Riggs Road to the County Line, Cloud Road will serve as a collector street instead of an arterial street as it is currently and, therefore, is not shown on the Plan. The 10 Year WATP should be completed by the year 2005. Table 6-3 summarizes the needed roadway improvements to complete the 10 Year WATP.

Table 6-3. Projects for the 10 Year WATP

Jurisdiction¹	Roadway	Project Area	Type of Work	Miles	Estimated Cost⁴ (\$)
Mesa	Pecos	Power to Sossaman	Construct 4 lanes	1.0	\$ 2,000,000
Gilbert/Maricopa County	Guadalupe Road ³	Recker to Higley	Widen from 2 to 4 lanes/bridge	1.0	1,000,000
Maricopa County	Riggs Road ³	Price to I-10	Widen from 2 to 4 lanes	2.0	2,000,000
Mesa	Higley Road	US60 to Baseline	Widen from 4 to 6 lanes	0.5	500,000
Gilbert/Maricopa County	Recker Road	Baseline to 1/2 mile South	Widen from 2 to 4 lanes	0.5	500,000
Mesa	Sossaman Road	Baseline to 1/2 mile South	Widen from 2 to 4 lanes	0.5	500,000
Mesa, Queen Creek	Riggs Road	Ellsworth to Rittenhouse	Construct 2 lanes	2.5	2,500,000
Maricopa County/Mesa	Ellsworth Road ³	Germann to Guadalupe	Widen from 2 to 4	6.0	6,000,000
Mesa	Sossaman Road	Williams Field Alignment to Pecos	Construct 4 lanes	1.0	2,000,000
Mesa	Sossaman Road	Pecos to 1/4 mile South of Germann	Construct 2 lanes/RR crossing	1.25	2,000,000
Mesa/Gilbert	Power Road	Williams Field to Pecos	Widen from 2 to 4	1.0	1,000,000
Total:					\$20,000,000

1 Project area may be annexed in the future changing the responsible jurisdiction.

2 Borders study area.

3 Possible CDBG eligibility.

4 Estimated costs for non-programmed projects are based on average cost per mile lane for all programmed projects in the Williams Area and exclude right-of-way costs.

20 Year Transportation Plan

The 20 Year Williams Area Transportation Plan incorporates all parts of the 10 Year WATP with many additions. To improve access to the Williams Area, the Santan Freeway

should be constructed as a four lane access controlled facility. A traffic interchange at the Hawes Road alignment should be added to the Santan Freeway plans. In addition, many arterial streets should be completed, so they provide continuous travel through the study area. Figure 6-5 illustrates the resulting number of lanes for each arterial street in the Williams Area for the 20 Year WATP. Mountain Road currently serves as an arterial street, however, with the completion of Meridian Road, Mountain Road will serve as a collector street and therefore is eliminated from the Plan. The 20 Year WATP should be completed by the year 2015. Table 6-4 summarizes the needed roadway improvements to complete the 20 Year WATP. Several of the projects are recommended to complete the piece-meal improvements identified in the capacity analysis.

Transit Element

A minimal transit service network for the year 2015 includes:

- Bus routes operating on approximately a two mile grid in the more heavily populated portions of the study area, operating at 30 to 60 minute frequencies. Connecting routes at the Superstition Mall operate every 30 minutes, thus, 30 minute frequencies are planned for the Power Road route. Route 156: Chandler Boulevard operates every 60 minutes, thus, a 60 minute frequency is planned for the extension of this route. These routes connect with the larger Valley Metro transit network operated through RPTA, but do not consider additional services which may be added to serve Gilbert.
- Peak hour express service on major corridors (including Power Road), in the Sun Lakes area, and to employment centers off Ellsworth and Warner Road.
- Major park-and-ride lots located near Ellsworth Road and Ocotillo Road, Sossaman Road and Germann Road, Higley Road and the Santan Freeway, and Val Vista Road and the Santan Freeway. These park-and-ride lots should be controlled by a public agency and located on the express routes.
- Active carpool and vanpool programs, especially for the southern portion of the study area.
- Paratransit services for persons who cannot access fixed route service, as required by the Americans with Disabilities Act.
- Circulator bus service within the Williams Gateway Airport development. Within the Williams Campus, the circulator would operate every 15 minutes.

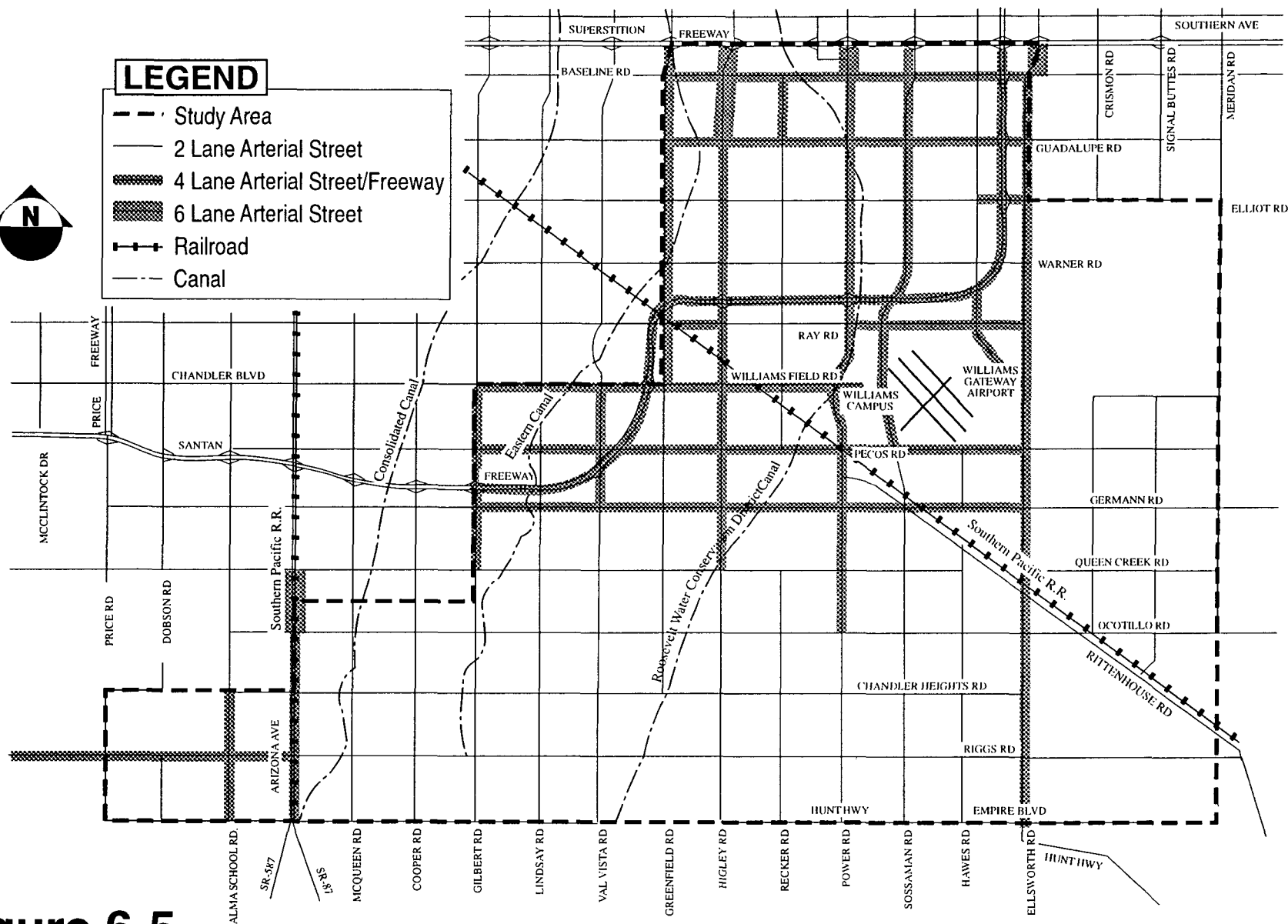


Figure 6-5
Twenty Year WATP

Table 6-4. Projects for the 20 Year WATP

Jurisdiction ¹	Roadway	Location	Type of Work	Miles	Estimated Cost ³ (\$)
Maricopa County	Val Vista Road	Germann to Williams Field	Widen from 2 to 4 Lanes	2.0	\$ 2,000,000
Maricopa County	Higley Road ²	RWDCD to Guadalupe	Widen from 2 to 4 Lanes	7.0	7,000,000
Gilbert/Mesa/Queek Creek	Power Road ²	Ocotillo to Pecos	Widen from 2 to 4 Lanes	3.0	3,000,000
Mesa/Maricopa County	Sossaman Road	Warner to Guadalupe	Widen from 2 to 4 Lanes	2.0	2,000,000
Maricopa County	Sossaman Road ²	Ray to Warner	Construct 4 Lanes	1.0	2,000,000
Queen Creek/Maricopa County	Ellsworth Road ²	Germann to Hunt Highway	Widen from 2 to 4 Lanes	5.0	5,000,000
Mesa/Maricopa County	Elliott Road	Hawes to Ellsworth	Widen from 2 to 4 Lanes	1.0	1,000,000
Gilbert/Maricopa County	Ray Road ²	Greenfield to Higley	Widen from 2 to 4 Lanes	1.0	1,000,000
Maricopa County/Gilbert	Pecos Road ²	Gilbert to Recker	Widen from 2 to 4 Lanes	5.0	5,000,000
Maricopa County	Germann Road	Gilbert to Higley	Widen from 2 to 4 Lanes/bridge	4.0	4,250,000
Queen Creek/Maricopa County	Germann Road ²	Sossaman to Ellsworth	Widen from 2 to 4 Lanes	2.0	2,000,000
Maricopa County	Hunt Highway	Price to Dobson	Construct 2 Lanes	1.0	1,000,000
Maricopa County	Price Road	Hunt Hwy to Chandler Heights	Construct 2 Lanes	2.0	2,000,000
Chandler/Maricopa County	Chandler Heights Road	Price to Dobson	Construct 2 Lanes	1.0	1,000,000
Maricopa County	Val Vista Road	Hunt Hwy to Riggs	Construct 2 Lanes	1.0	1,000,000
Maricopa County	Ocotillo Road	Greenfield to Power	Construct 2 Lanes/bridge	3.0	4,000,000
Queen Creek/Maricopa County	Queen Creek ²	Power to Hawes	Construct 2 Lanes/bridge	2.0	3,200,000
Mesa	Pecos Road ²	Sossaman to Ellsworth	Construct 4 Lanes	2.0	4,000,000
Queen Creek/Mesa	Germann Road ²	1/4 mi E Sossaman to Higley	Construct 4 Lanes/RR xing/bridge	3.25	7,700,000
Gilbert/Mesa	Guadalupe Road	Recker to Ellsworth	Widen from 2 to 4 Lanes	4.0	4,000,000
Chandler/Maricopa County	Gilbert Road	Germann to Williams Field	Widen from 2 to 4 Lanes	2.0	2,000,000
Gilbert	Greenfield Road ²	Williams Field to Knox	Widen from 2 to 4 Lanes	1.5	1,500,000
Mesa/Maricopa County	Hawes Road	Warner to Ellsworth	Construct 4 Lanes/bridge	2.0	4,250,000
Gilbert	Pecos Road	Recker to Power	Construct 4 Lanes/RR xing	1.0	4,000,000
Maricopa County/Gilbert	Recker Road	Hunt Hwy to Queen Creek	Construct 2 Lanes	4.0	4,000,000
Maricopa County	Warner Road ²	Power to Sossaman	Construct 2 Lanes/bridge	1.0	2,000,000
Mesa/Maricopa County	Meridan Road ²	Elliot to Ocotillo	Construct 2 Lanes	7.0	7,000,000
Mesa/Maricopa County	Crismon Road ²	Williams Field to Queen Creek	Construct 2 Lanes	3.0	3,000,000
Mesa/Maricopa County	Signal Butte Road ²	Williams Field to Queen Creek	Construct 2 Lanes	3.0	3,000,000
Queen Creek/Maricopa County	Signal Butte Road	Ocotillo to Rittenhouse	Construct 2 Lanes/RR xing	1.0	1,300,000
Mesa/Maricopa County	Hawes Road	Warner to Guadalupe	Construct 2 Lanes	2.0	2,000,000
Mesa	Ray Road ²	Sossaman to Ellsworth	Construct 4 lanes	2.0	4,000,000
Mesa	Williams Field Road ²	Crismon to Meridian	Construct 2 lanes	2.0	2,000,000
					Total: \$102,200,000

1 Project area may be annexed in the future changing the responsible jurisdiction.

2 Possible GDBG.

3 Estimated costs for non-programmed projects are based on average cost per mile lane for all programmed projects in the Williams Area and exclude right-of-way costs.

These services would be phased in over time, based on development and ridership levels. Figures 6-6, 6-7, and 6-8 indicate a suggested phasing based on the projected development of the area. A determination will need to be made of which major corridors warrant peak hour express service. The services illustrated in these maps should be considered sketch plans which provide the relative level of service and corridors needing to be served. Detailed service planning will be needed prior to the initiation of any service to refine the sketch plan alternatives.

Although overall densities in the project area remain low in the year 2000 (only the northern edge of the study area will have densities over three residents and employees per acre), the development of the Williams Campus warrants a minimal level of service on Power Road and on Williams Field Road. Additional services on Higley Road and on Power Road south of Williams Gateway Airport, along with two park-and-ride facilities are recommended for year 2005. These park-and-ride facilities should be located to serve both fixed route bus and potential commuter rail passengers.

By year 2015 additional services are programmed to fill out the two mile grid of service. In addition, two additional park-and-ride facilities are planned near interchanges of the proposed Santan Freeway. In addition to the park-and-ride lots identified here, additional lease agreements for park-and-ride facilities are recommended throughout the study area to provide access to residents. This is particularly important in the southern half of the study area. Transit service connecting to the regional system is planned for the Sun Lakes area which is anticipated to have approximately 20,000 residents by the year 2015. In addition, a local route deviation transit service which circulates within Sun Lakes may be appropriate. Additional express services which penetrate the neighborhoods at the southern edge of the study area may also be warranted.

Figure 6-9 illustrates a second, more comprehensive, option for transit services in the year 2015 which is based on a higher mode split for transit. The demographic projections and development patterns indicate that the ridership to support Option B is reasonable to attain. However, in order for the services to be most effective they would need to connect to a more comprehensive transit network serving the rest of the metropolitan area than presently



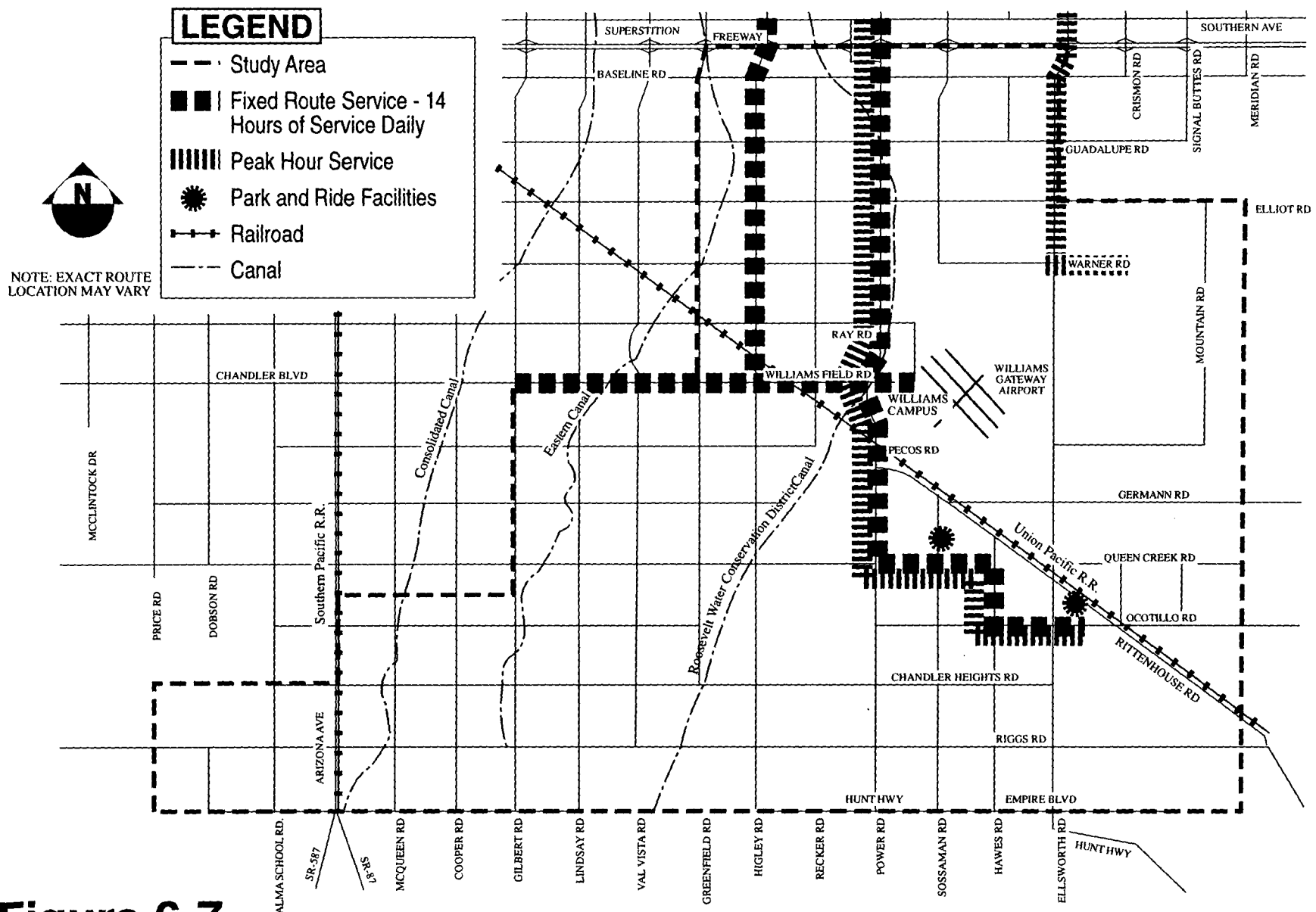


Figure 6-7
Year 2005 Proposed Transit Network

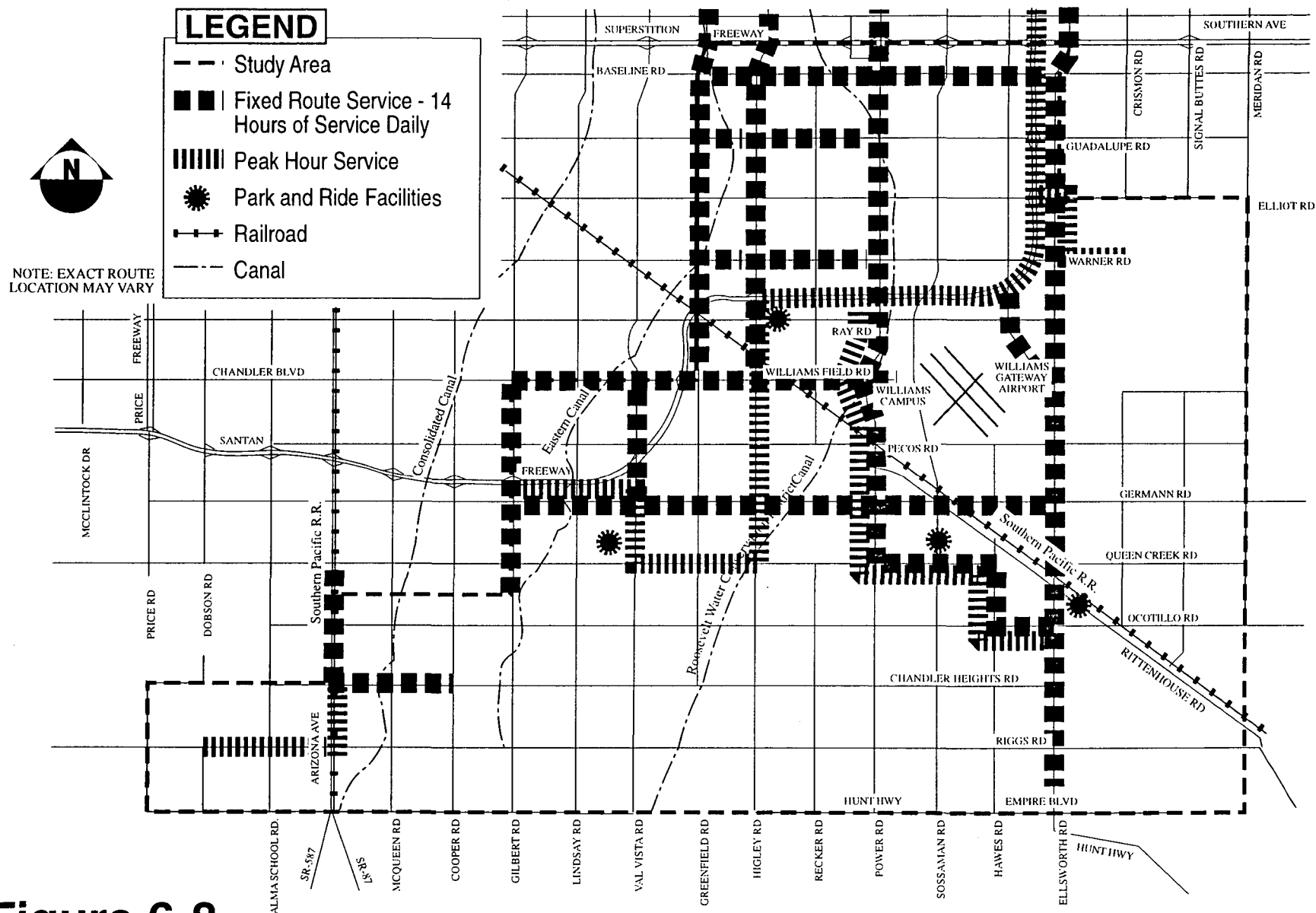


Figure 6-8
Year 2015 with Santan Freeway Proposed Transit Network - Option A

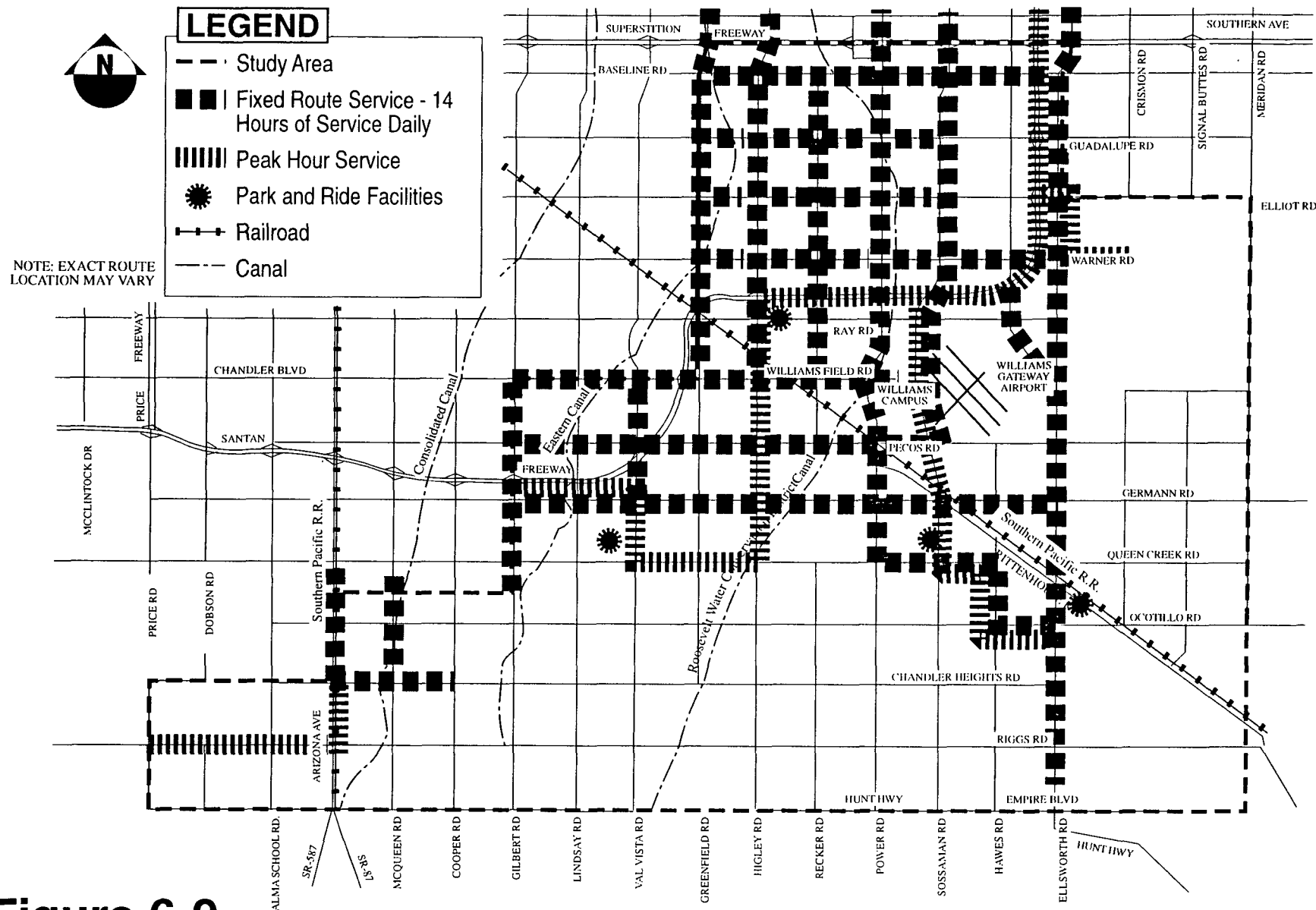


Figure 6-9
Year 2015 with Santan Freeway Proposed Transit Network - Option B

exists. Recent developments indicate that the Phoenix metropolitan area may be moving towards more comprehensive transit service.

Table 6-5 presents information on service levels, ridership and costs for the proposed services within the study area. Additional costs will exist for taking the services outside the study area boundary. It is assumed that to the extent these routes provide service to other jurisdictions, the costs will be shared. A minimal program is reflected for the year 2000 but by 2015 the service is extensive. As this is prepared at the sketch planning level, the numbers should be considered to reflect the magnitude of the service needs and expenses. As service is implemented, service improvements will be guided by ridership growth.

While the services are identified for the study area only, they will need to connect to the larger ValleyMetro transit network operated through RPTA. The connections to the ValleyMetro services will be important in determining the sequence of service improvements, actual costs and fleet requirements.

Table 6-5 indicates the costs for fixed route and paratransit services. Costs are not identified for carpool programs nor for the construction of park-and-ride lots. The cost of carpool/vanpool programs are operated region-wide and vary depending on the funding structure. An increase in the administrative overhead of the program might be warranted based on the number of additional clients registered or specific outreach programs undertaken in the study area. If the RPTA vanpool program is expanded to the study area, additional capital may be needed for vans, depending on program structure.

The cost of the four park-and-ride lots is estimated to range from \$5,000 to \$8,000 per space. The size of the facilities will determine the cost, and should be based on the types of services to be operated in the corridors. The size will be substantially greater if commuter rail services are provided. The land for the lots located at the intersection of the Santan Freeway should be obtained as part of the freeway construction.

Transit Implementation

Whether the year 2015 Option A or Option B evolves will depend largely on external factors such as the development of a more comprehensive transit network outside the study area and potential for commuter rail. If the metropolitan region increases bus services,

Table 6-5. Transit Service Levels by Year

	2000	2005	2015 - 1 %	2015 - 2 %+
Frequency	30/60 min.	30/60 min.	30/60 min.	30 min.
Daily Service Hours	49	104	251	589
Daily Ridership ²	1,225	2,608	6,267	14,725
Annual Service Hours ³	14,900	31,800	76,500	179,600
Ridership ⁴	373,600	795,500	1,911,300	4,491,100
Fixed Route Revenue ⁵	\$261,500	\$556,900	\$1,337,900	\$3,143,800
Fixed Route Operating Ratio	39%	39%	39%	39%
Approximate Fixed Route Fleet ⁶	5	10	25	53
Annual Paratransit Service Trips ⁷	6,749	30,788	118,038	118,038
Paratransit Revenue ⁵	\$9,400	\$43,100	\$165,300	\$165,300
Paratransit Operating Ratio	9%	9%	9%	9%
Paratransit Operating Cost ⁸	\$101,200	\$461,800	\$1,770,600	\$1,770,600
Fixed Route Operating Cost ⁹	\$670,500	\$1431,000	\$3,442,500	\$8,082,000
Annualized Capital Cost ¹⁰	\$133,300	\$186,700	\$666,700	\$1,413,300
Total Annual Cost	\$905,000	\$2,079,500	\$5,879,800	\$11,265,900
Net Annual Cost	\$634,100	\$1,479,500	\$4,376,600	\$7,956,800

- 1 In 2005 and 2015, additional peak hour express trips are projected for major corridors and specific peak hour only routes. This represents average frequency and the frequency on individual routes may vary somewhat. Service is projected based on a 14 hour day.
- 2 Ridership is calculated at 25 persons per hour. (The average RPTA ridership on routes.)
- 3 Annual service hours are based on operating six days per week, 305 days per year.
- 4 Annual ridership is based on operating six days per week, 305 days per year.
- 5 Fixed route revenue is based on an average fare of \$0.70. Paratransit revenue is based on an average fare of \$1.40.
- 6 Fleet size is calculated based on a 14 hour day for routes operating all day with a 20% ratio. Additional vehicles are added for express service.
- 7 Paratransit trips are based on the population in traffic analysis zones adjacent to the routes. Of the total population, 1.3% are assumed to require paratransit service and they are estimated to take an average of one trip per week. This is based on research for the Environmental Assessment on the ADA regulations as conducted by Hinckly & Associates.
- 8 The cost of paratransit trips are assumed to be \$15 per trip, in constant dollars.
- 9 The operating cost for fixed route service is \$45 per hour, in constant dollars.
- 10 The annualized capital cost is based on a vehicle cost of \$320,000 each with a useful life of 12 years. The actual capital costs may vary significantly depending on fleet mix—the balance of the metropolitan area transit network.

Option B is attainable in the study area. Option B does represent an attainable level of ridership (2 percent mode split) and is the most effective at addressing the transportation needs of the residents and businesses in the area. If there is serious interest in the development of commuter rail services, a solid network of transit services which would act as feeders to the line would be needed, again supporting Option B.

Carpool and vanpool ridership is likely to play a significant role in the study area. It is recommended that the development of park-and-ride facilities be given high priority in the facilities plans for the study area.

IMPLEMENTATION

Cost Estimates

The cost estimates presented in this chapter were based on the cost of projects from the MAG Transportation Improvement Program. The average cost to construct or widen one lane mile of arterial street is approximately \$500,000. Costs ranged from \$300,000 to \$1.2 million per lane mile. Bridge reconstruction ranged from \$250,000 for a structure over the Eastern Canal to \$1.2 million for a structure over the Queen Creek Wash. At-grade railroad crossings cost several hundred thousand dollars and grade separations can cost two million dollars. To establish estimated costs to implement the Williams Area Transportation Plan, average costs were used. These cost estimates are only averages, costs for individual projects could be much higher or lower when actually designed and constructed.

Funding Sources

Several different types of funding are available to jurisdictions in the Phoenix metropolitan area for roadway construction. These include:

1. Surface Transportation Program-MAG (STP-MAG): These funds are programmed by MAG from its allocation of ISTEA funds. The MAG Interim Congestion Management System (CMS) is used to pick projects to receive these funds. The CMS rates freeways, streets, transit and bicycle projects for their impact on reducing congestion. All scores are relative to each other.
2. Congestion Mitigation and Air Quality Improvement Program (CMAQ): These funds are programmed from ISTEA funds for projects that will contribute to the attainment of ambient air quality standards and reduce congestion. Possible projects that could receive these funds include demand management and bicycle projects.

3. Surface Transportation Program (STP): ADOT allocated these ISTEA funds for segments of the Interstate System and State Highway System. These funds, however, may be used for bridge rehabilitation and safety projects.
4. Arizona Highway User Revenues (HURF): These funds are distributed by ADOT from the state gas tax. The funds are allotted to each jurisdiction based on population.
5. Regional Area Road Funds(RARF): These funds are Proposition 300 sales tax revenue funds which may only be used on controlled access highways. These funds could be used on the Santan Freeway.
6. Local Funds: Local governments provide these funds from such sources as bonds, HURF allotments, sales and property taxes etc. These funds can be used on any transportation projects.
7. Private Funds: These funds are provided by private land developers as part of a development project. Many jurisdictions require developers to donate the right-of-way for streets that front their property when the land is developed. The developer is also responsible for contributing to a share of the roadway and traffic signals construction costs. This is the best source of funding for local roadways. However, it often causes a "piece meal" development of the roadway network. Only segments fronting a development are improved. Adjacent segments are not improved until the land fronting them are developed.
8. Community Development Block Grant (CDBG): These funds are provided by the Federal Office of Housing and Urban Development. CDBG funds can be used in the construction of capital improvement projects (such as sewer, streets, water and waste water treatment plants, housing, and parks) that benefit low to medium income groups. Projects that alleviate slums or address an urgent need (such as circumstances caused by a natural disaster) can also use CDBG funds. Most projects in Maricopa County that qualified for CDBG funds assisted low income populations, however, the Town of Gilbert was able to use CDBG funds in its Heritage District (in the pursuit of eliminating blight).

For a transportation improvement to be eligible for CDBG funding would require the project to be located in a census tract or block group with at least 51 percent of the population in the low and moderate income group. In the WATP study area this includes block groups surrounding the WGA and Williams Campus and one near Sun Lakes. These areas eligible for CDBG funds are illustrated in Figure 6-10. Smaller areas within a block can also be surveyed to determine eligibility for CDBG funding. This has been done for the Town of Queen Creek, and an eligible area was identified. This area is the town center between Queen Creek Road and Riggs Road, and between Hawes Road and Crismon Road, excluding

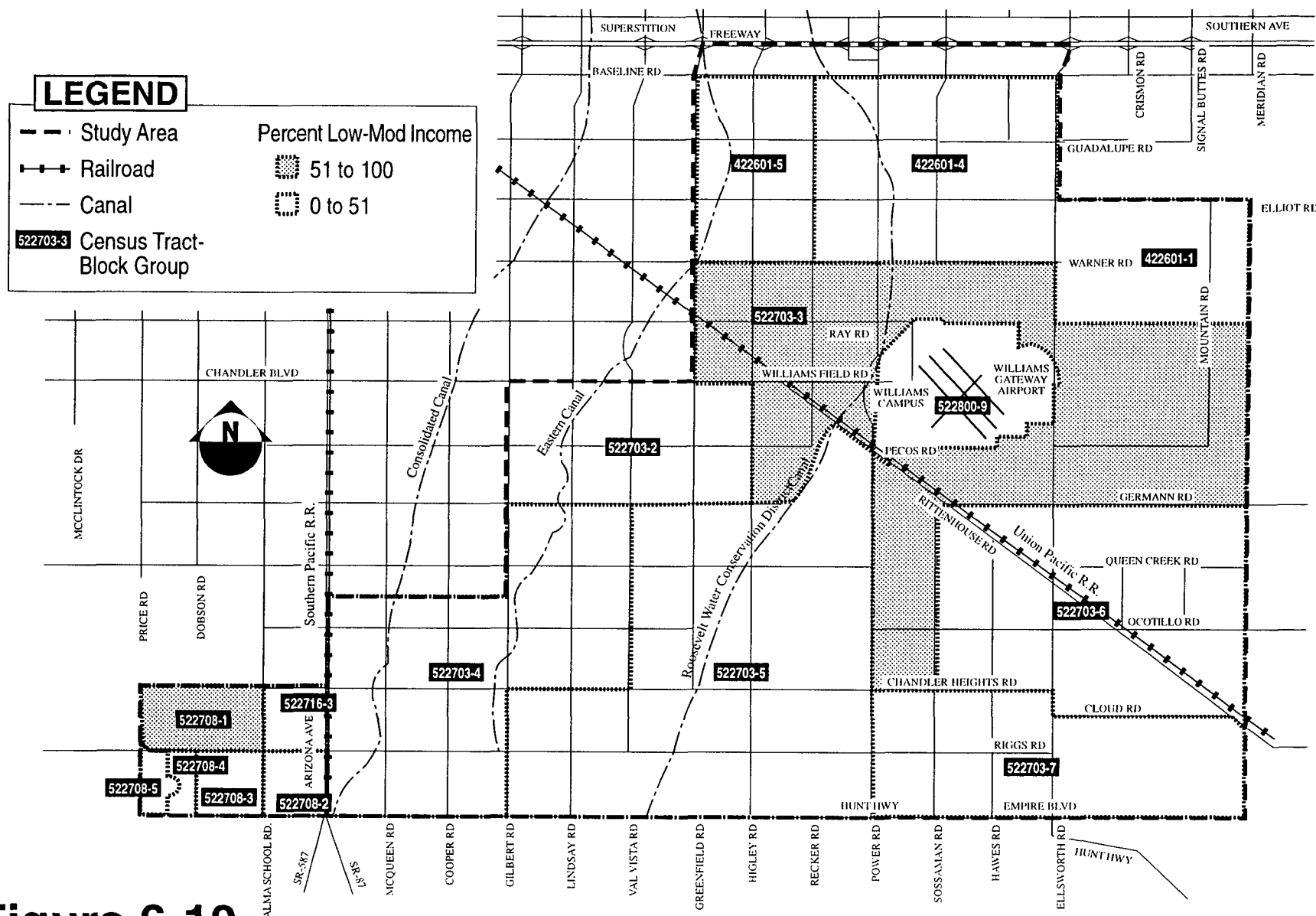


Figure 6-10
CDBG Eligibility in the WATP Study Area

the trailer park west of Hawes Road on Chandler Heights Road and the country club development west of Crismon Road off of Ocotillo Road.

Funding For Williams Area Projects

Most of the funding sources listed above are available for transportation projects within the Williams Area, however, all these funds are highly competitive. Funding for the Santan Freeway will come from RARF and HURF funds as part of the Regional Freeway Plan. As discussed above, some areas in the Williams Area are eligible for CDBG funds. These funds are also highly competitive. Bicycle and traffic signal coordination projects would be eligible for CMAQ funds.

The mostly likely source of funding for transportation projects in the Williams Area is from local sources and private developers. Table 6-6 summarizes the funding sources of all MAG Transportation Improvement Program programmed projects for the Williams Area between 1996 and 2000. Of the total funding for these projects, 84 percent came from local and private sources, with close to 75 percent of the local and private sources being from private sources. Therefore, private sources are the best source of funding for projects in the Williams Area.

Table 6-6. Funding of Programmed Projects in the Williams Area

Year	Local	Private	State	Total
1996	1,900,000	9,940,000	7,000,000	18,840,000
1997	2,000,000	3,570,000	0	5,570,000
1998	4,700,000	3,700,000	0	8,400,000
1999	1,200,000	1,900,000	0	3,100,000
2000	0	7,500,000	0	7,500,000
Total	9,800,000	26,610,000	7,000,000	43,410,000
Percentage	22.6%	61.3%	16.1%	100.0%

The arterial street improvements recommended in the Williams Area Transportation Plan will cost an estimated \$120 million beyond what is programmed for the next five years. If the percentages for funding sources hold, this means that approximately \$20 million will

come from State sources, \$25 million will come from county and city funds, and \$75 million will be privately funded.

Benefit Cost

To illustrate the benefit of implementing the recommended WATP roadway network, the benefit-cost ratio was computed for the one mile segment of Warner Road between Greenfield Road and Higley Road. This two lane segment is expected to have an ADT of 17,000 vehicles and a LOS of E in the year 2015. Approximately 1,500 vehicles would use the road during the peak period at, estimating from HCM software, an average travel speed of 13.0 mph. If the section is improved to four lanes, it will operate at LOS A with the average travel speed being 35 mph. The difference in travel speed results in a savings of 2.9 minutes per vehicle to travel this section of roadway. Assuming 2 peak hours a day and 260 working days a year, a total of 37,700 vehicle hours of delay would occur without the improvement for the 1,500 peak hour vehicles. Assuming a \$12/hour of delay cost results in \$450,000 in savings in delay per year.

To improve the roadway segment would cost an estimated \$1,000,000 spreading the cost equally over a 20 year design life, costs equate to \$50,000 per year. Thus the benefit to cost ratio (B/C) for the project would be 9.0.

B/C ratios for other projects are expected to show similar results. Substantial savings in delay costs by improving two lane roadways that operate at LOS E or F will easily offset the construction costs for the improvement projects.

A p p e n d i x

WILLIAMS AREA TRANSPORTATION PLAN TRAFFIC ANALYSIS ZONE SPLITS

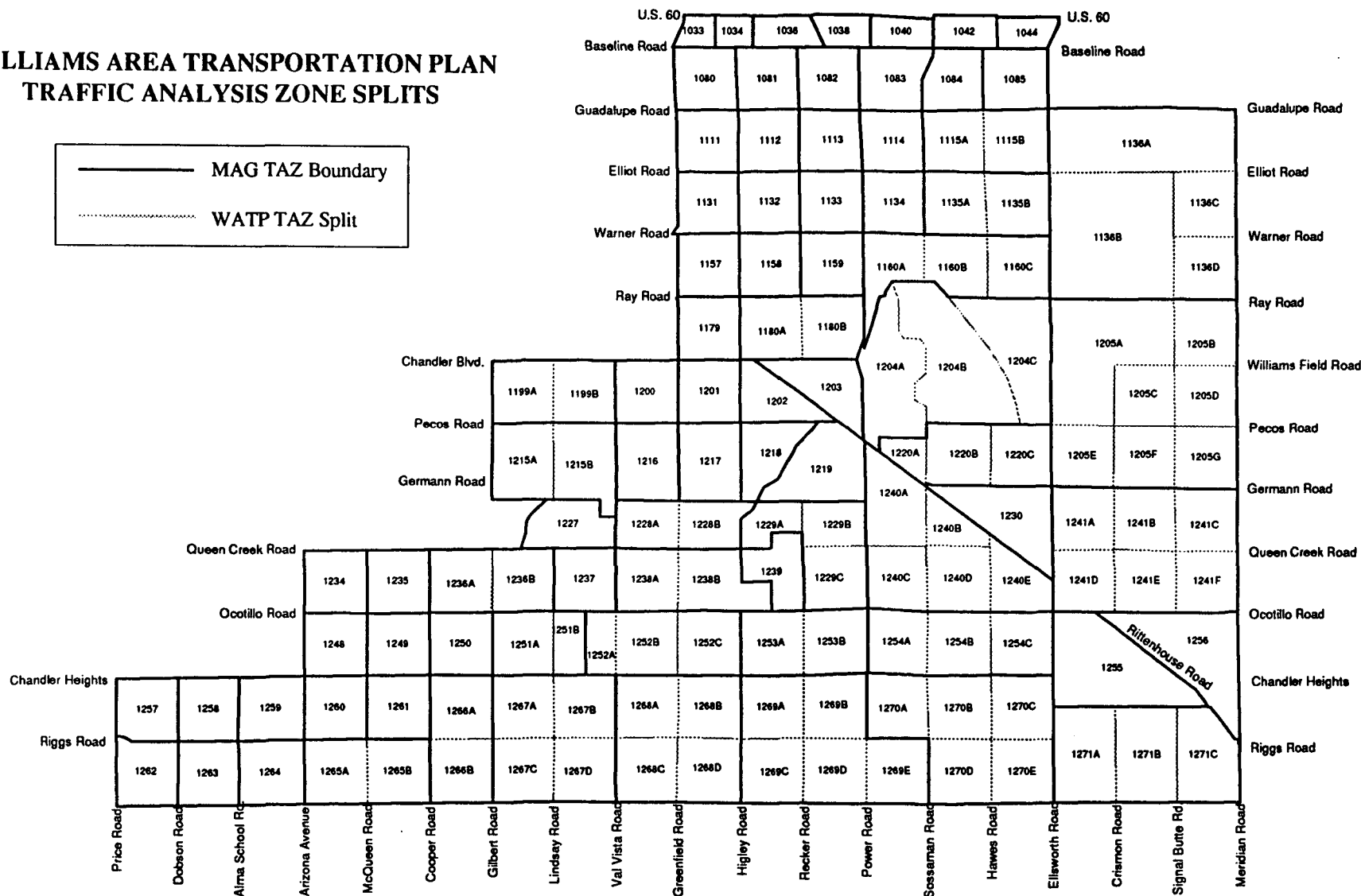
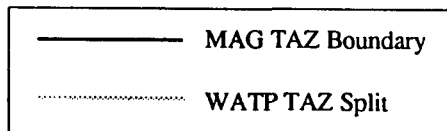


TABLE A-1
RESIDENTIAL HOUSING UNIT PROJECTIONS BY TAZ
WILLIAMS AREA TRANSPORTATION PLAN

TAZ	Low Density Housing Units					High Density Housing Units					Total Housing Units				
	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015
1033	11	11	12	12	12	0	0	0	0	0	11	11	12	12	12
1034	4	4	4	4	4	0	0	0	0	0	4	4	4	4	4
1036	18	18	18	18	18	0	0	0	0	0	18	18	18	18	18
1038	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1040	184	198	215	226	233	100	124	187	252	307	284	322	402	478	541
1042	821	821	821	821	821	0	31	113	199	271	821	852	934	1,020	1,092
1044	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1080	182	425	730	930	1,057	0	0	0	0	0	182	425	730	930	1,057
1081	141	432	797	1,037	1,190	0	0	0	0	0	141	432	797	1,037	1,190
1082	478	546	632	688	724	140	140	140	140	140	618	686	772	828	864
1083	306	320	337	348	355	0	0	0	0	0	306	320	337	348	355
1084	1,325	1,391	1,475	1,529	1,564	400	419	470	523	567	1,725	1,811	1,945	2,052	2,131
1085	0	0	0	0	0	576	605	782	1,276	1,926	576	605	782	1,276	1,926
1111	157	265	401	490	547	0	0	0	0	0	157	265	401	490	547
1112	96	500	1,007	1,340	1,551	0	0	0	0	0	96	500	1,007	1,340	1,551
1113	5	146	323	439	513	0	132	478	837	1,141	5	278	801	1,276	1,654
1114	156	263	473	887	1,025	0	0	0	0	0	156	263	473	887	1,025
1115A	139	165	270	456	865	0	0	0	0	0	139	165	270	456	865
1115B	46	46	46	46	46	0	37	270	705	1,216	46	83	316	751	1,263
1131	35	315	666	897	1,044	0	0	0	0	0	35	315	666	897	1,044
1132	4	119	343	785	933	0	18	124	422	814	4	136	467	1,208	1,747
1133	2	2	2	2	2	0	9	62	211	406	2	11	64	213	408
1134	53	53	53	53	53	0	0	0	0	0	53	53	53	53	53
1135A	25	25	25	25	25	0	0	0	0	0	25	25	25	25	25
1135B	13	13	13	13	13	0	0	0	0	0	13	13	13	13	13
1136A	0	69	208	576	1,063	0	0	0	0	0	0	69	208	576	1,063
1136B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1136C	0	15	47	130	240	0	0	0	0	0	0	15	47	130	240
1136D	0	2	5	13	24	0	0	0	0	0	0	2	5	13	24
1157	2	209	468	638	746	0	72	261	456	622	2	281	728	1,094	1,368
1158	12	12	12	12	12	0	25	177	604	1,164	12	37	189	616	1,176
1159	16	16	16	16	16	0	25	177	604	1,164	16	41	193	620	1,180
1160A	23	23	23	23	23	0	0	0	0	0	23	23	23	23	23
1160B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1160C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE A-1 (Continued)
RESIDENTIAL HOUSING UNIT PROJECTIONS BY TAZ
WILLIAMS AREA TRANSPORTATION PLAN

TAZ	Low Density Housing Units					High Density Housing Units					Total Housing Units				
	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015
1179	23	58	198	445	989	0	0	0	0	0	23	58	198	445	989
1180A	0	170	502	1,158	1,377	40	48	97	233	412	40	218	599	1,391	1,789
1180B	0	62	184	425	505	40	55	143	391	716	40	117	328	816	1,222
1199A	51	388	811	1,089	1,265	0	0	0	0	0	51	388	811	1,089	1,265
1199B	0	6	17	46	85	0	25	141	359	614	0	30	158	405	700
1200	15	16	22	31	52	0	0	0	0	0	15	16	22	31	52
1201	125	137	185	271	458	0	0	0	0	0	125	137	185	271	458
1202	14	47	113	287	517	0	0	0	0	0	14	47	113	287	517
1203	1	36	105	240	285	0	7	46	158	304	1	43	151	398	590
1204A	714	714	714	714	714	312	600	600	600	600	1,026	1,314	1,314	1,314	1,314
1204B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1204C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1205A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1205B	88	90	93	101	111	0	0	0	0	0	88	90	93	101	111
1205C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1205D	69	69	69	69	69	0	0	0	0	0	69	69	69	69	69
1205E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1205F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1205G	39	39	39	39	39	0	0	0	0	0	39	39	39	39	39
1215A	32	32	32	32	32	0	0	0	0	0	32	32	32	32	32
1215B	50	65	126	233	470	0	0	0	0	0	50	65	126	233	470
1216	147	164	235	359	633	0	0	0	0	0	147	164	235	359	633
1217	5	116	333	761	904	13	13	13	13	13	18	129	346	774	917
1218	0	203	598	1,379	1,639	4	4	4	4	4	4	207	602	1,383	1,643
1219	10	190	541	1,235	1,466	0	18	129	439	845	10	208	670	1,673	2,311
1220A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1220B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1220C	3	3	4	5	7	0	0	0	0	0	3	3	4	5	7
1227	0	8	23	63	117	0	0	0	0	0	0	8	23	63	117
1228A	39	46	77	130	248	0	0	0	0	0	39	46	77	130	248
1228B	0	26	77	178	212	0	0	0	0	0	0	26	77	178	212
1229A	0	46	234	563	1,289	0	0	0	0	0	0	46	234	563	1,289
1229B	2	48	236	566	1,294	0	0	0	0	0	2	48	236	566	1,294
1229C	1	63	316	759	1,737	0	0	0	0	0	1	63	316	759	1,737
1230	81	81	81	81	81	0	0	0	0	0	81	81	81	81	81

TABLE A-1 (Continued)
RESIDENTIAL HOUSING UNIT PROJECTIONS BY TAZ
WILLIAMS AREA TRANSPORTATION PLAN

TAZ	Low Density Housing Units					High Density Housing Units					Total Housing Units				
	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015
1234	18	18	18	18	18	0	0	0	0	0	18	18	18	18	18
1235	34	37	44	56	61	0	0	0	0	0	34	37	44	56	61
1236A	19	27	59	115	239	0	0	0	0	0	19	27	59	115	239
1236B	74	84	104	157	227	0	0	0	0	0	74	84	104	157	227
1237	14	17	23	38	59	0	0	0	0	0	14	17	23	38	59
1238A	99	100	101	106	111	0	0	0	0	0	99	100	101	106	111
1238B	20	23	28	43	63	0	0	0	0	0	20	23	28	43	63
1239	0	31	94	260	479	0	0	0	0	0	0	31	94	260	479
1240A	11	306	881	2,017	2,395	0	0	0	0	0	11	306	881	2,017	2,395
1240B	8	394	878	1,196	1,398	0	0	0	0	0	8	394	878	1,196	1,398
1240C	0	215	634	1,461	1,737	0	0	0	0	0	0	215	634	1,461	1,737
1240D	0	500	1,126	1,538	1,799	0	0	0	0	0	0	500	1,126	1,538	1,799
1240E	27	427	927	1,257	1,466	0	20	72	127	173	27	447	1,000	1,384	1,639
1241A	9	11	15	26	41	0	0	0	0	0	9	11	15	26	41
1241B	9	9	9	9	9	0	0	0	0	0	9	9	9	9	9
1241C	9	9	9	9	9	0	0	0	0	0	9	9	9	9	9
1241D	9	175	499	1,138	1,351	0	1	4	15	28	9	176	503	1,153	1,380
1241E	9	58	256	605	1,373	0	0	0	0	0	9	58	256	605	1,373
1241F	0	14	42	116	215	0	0	0	0	0	0	14	42	116	215
1248	27	55	168	367	805	0	0	0	0	0	27	55	168	367	805
1249	25	70	255	578	1,292	0	0	0	0	0	25	70	255	578	1,292
1250	35	46	67	124	199	0	0	0	0	0	35	46	67	124	199
1251A	23	35	60	124	209	0	0	0	0	0	23	35	60	124	209
1251B	12	18	29	61	102	0	0	0	0	0	12	18	29	61	102
1252A	3	4	7	16	27	0	0	0	0	0	3	4	7	16	27
1252B	42	45	50	65	84	0	0	0	0	0	42	45	50	65	84
1252C	3	5	10	23	40	0	0	0	0	0	3	5	10	23	40
1253A	26	29	35	50	71	0	0	0	0	0	26	29	35	50	71
1253B	53	56	71	96	151	0	0	0	0	0	53	56	71	96	151
1254A	106	119	174	270	482	0	0	0	0	0	106	119	174	270	482
1254B	106	152	242	421	480	0	0	0	0	0	106	152	242	421	480
1254C	6	198	574	1,316	1,563	0	0	0	0	0	6	198	574	1,316	1,563
1255	144	1,223	2,573	3,462	4,027	0	8	29	51	69	144	1,231	2,602	3,513	4,096
1256	18	71	285	662	1,493	0	0	0	0	0	18	71	285	662	1,493
1257	206	401	644	805	906	0	0	0	0	0	206	401	644	805	906

TABLE A-1 (Continued)
RESIDENTIAL HOUSING UNIT PROJECTIONS BY TAZ
WILLIAMS AREA TRANSPORTATION PLAN

TAZ	Low Density Housing Units					High Density Housing Units					Total Housing Units				
	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015
1258	209	434	715	900	1,018	0	67	241	423	576	209	500	956	1,323	1,594
1259	739	832	948	1,025	1,073	0	27	97	169	230	739	859	1,045	1,194	1,304
1260	8	8	8	8	8	0	0	0	0	0	8	8	8	8	8
1261	362	363	364	368	373	0	0	0	0	0	362	363	364	368	373
1262	2,080	2,091	2,105	2,114	2,119	0	0	0	0	0	2,080	2,091	2,105	2,114	2,119
1263	1,202	1,209	1,218	1,224	1,228	265	265	265	265	265	1,467	1,474	1,483	1,489	1,493
1264	1,415	1,448	1,489	1,516	1,533	0	0	0	0	0	1,415	1,448	1,489	1,516	1,533
1265A	13	32	112	251	559	0	0	0	0	0	13	32	112	251	559
1265B	527	702	921	1,065	1,157	0	0	0	0	0	527	702	921	1,065	1,157
1266A	228	249	292	407	558	0	0	0	0	0	228	249	292	407	558
1266B	25	38	63	130	219	0	0	0	0	0	25	38	63	130	219
1267A	11	14	20	35	55	0	0	0	0	0	11	14	20	35	55
1267B	22	25	30	44	63	0	0	0	0	0	22	25	30	44	63
1267C	1	4	9	24	44	0	0	0	0	0	1	4	9	24	44
1267D	55	58	63	77	95	0	0	0	0	0	55	58	63	77	95
1268A	1	2	6	14	25	0	0	0	0	0	1	2	6	14	25
1268B	2	4	7	15	26	0	0	0	0	0	2	4	7	15	26
1268C	53	54	55	58	63	0	0	0	0	0	53	54	55	58	63
1268D	28	30	34	44	57	0	0	0	0	0	28	30	34	44	57
1269A	0	2	5	13	24	0	0	0	0	0	0	2	5	13	24
1269B	0	2	5	13	24	0	0	0	0	0	0	2	5	13	24
1269C	7	10	14	26	42	0	0	0	0	0	7	10	14	26	42
1269D	159	159	160	161	164	0	0	0	0	0	159	159	160	161	164
1269E	79	80	82	86	92	0	0	0	0	0	79	80	82	86	92
1270A	275	276	279	286	296	0	0	0	0	0	275	276	279	286	296
1270B	155	158	164	181	202	0	0	0	0	0	155	158	164	181	202
1270C	3	13	32	84	153	0	0	0	0	0	3	13	32	84	153
1270D	12	15	21	38	59	0	0	0	0	0	12	15	21	38	59
1270E	9	12	17	31	49	0	0	0	0	0	9	12	17	31	49
1271A	3	106	308	708	841	0	0	0	0	0	3	106	308	708	841
1271B	3	12	30	78	142	0	0	0	0	0	3	12	30	78	142
1271C	7	11	20	44	76	0	0	0	0	0	7	11	20	44	76
TOTAL	14,658	22,780	35,993	53,387	68,732	1,890	2,792	5,124	9,473	14,588	16,548	25,572	41,117	62,860	83,320

Source: Applied Economics, 1996.

TABLE A-2
RESIDENTIAL POPULATION PROJECTIONS BY TAZ
WILLIAMS AREA TRANSPORTATION STUDY

[illegible]

TABLE A-2 (Continued)
RESIDENTIAL POPULATION PROJECTIONS BY TAZ
WILLIAMS AREA TRANSPORTATION STUDY

TAZ	1995 Estimates		Housing Additions				Population			
	Units	Population	1995-00	2000-05	2005-10	2010-15	2000	2005	2010	2015
1179	23	91	35	141	247	544	177	548	1,211	2,702
1180A	40	66	178	381	792	398	504	1,464	3,466	4,384
1180B	40	66	77	210	488	406	246	720	1,800	2,600
1199A	51	165	337	422	278	177	1,008	2,122	2,869	3,353
1199B	0	0	30	128	247	295	54	284	744	1,307
1200	15	62	1	5	10	21	65	79	105	163
1201	125	460	12	48	85	188	490	618	847	1,361
1202	14	57	33	66	174	230	138	312	780	1,411
1203	1	1	42	108	247	192	99	348	907	1,292
1204A	1,026	1,440	288	0	0	0	2,720	2,720	2,720	2,720
1204B	0	0	0	0	0	0	0	0	0	0
1204C	0	0	0	0	0	0	0	0	0	0
1205A	0	0	0	0	0	0	0	0	0	0
1205B	88	266	1	3	8	11	270	278	299	328
1205C	0	0	0	0	0	0	0	0	0	0
1205D	69	207	0	0	0	0	207	207	207	207
1205E	0	0	0	0	0	0	0	0	0	0
1205F	0	0	0	0	0	0	0	0	0	0
1205G	39	118	0	0	0	0	118	118	118	118
1215A	32	96	0	0	0	0	96	96	96	96
1215B	50	148	15	61	107	237	186	347	635	1,283
1216	147	522	17	71	124	274	565	752	1,086	1,836
1217	18	63	111	217	428	143	340	912	2,063	2,454
1218	4	21	203	395	781	260	527	1,570	3,669	4,382
1219	10	42	198	462	1,003	638	521	1,638	4,044	5,402
1220A	0	0	0	0	0	0	0	0	0	0
1220B	0	0	0	0	0	0	0	0	0	0
1220C	3	19	0	0	1	2	20	21	24	29
1227	0	0	8	15	40	54	19	60	169	316
1228A	39	141	7	30	53	118	160	240	383	705
1228B	0	0	26	51	101	34	65	200	472	564
1229A	0	0	46	188	329	726	115	610	1,495	3,484
1229B	2	3	46	188	330	728	118	614	1,501	3,494
1229C	1	1	62	253	443	978	156	823	2,015	4,694
1230	81	226	0	0	0	0	226	226	226	226

TABLE A-2 (Continued)
RESIDENTIAL POPULATION PROJECTIONS BY TAZ
WILLIAMS AREA TRANSPORTATION STUDY

TAZ	1995 Estimates		Housing Additions				Population			
	Units	Population	1995-00	2000-05	2005-10	2010-15	2000	2005	2010	2015
1234	18	87	0	0	0	0	87	87	87	87
1235	34	113	3	6	13	4	121	138	172	184
1236A	19	71	8	32	56	124	91	176	328	669
1236B	74	284	10	20	53	70	309	362	504	696
1237	14	60	3	6	16	21	67	83	125	181
1238A	99	340	1	2	4	5	342	346	357	372
1238B	20	68	3	6	15	20	75	90	130	184
1239	0	0	31	63	166	219	77	243	689	1,290
1240A	11	69	295	575	1,136	379	805	2,323	5,377	6,414
1240B	8	52	386	483	318	202	1,016	2,291	3,146	3,699
1240C	0	0	215	419	828	276	536	1,642	3,867	4,622
1240D	0	0	500	626	412	262	1,249	2,900	4,007	4,724
1240E	27	172	420	553	384	255	1,203	2,613	3,593	4,248
1241A	9	27	2	4	11	15	32	43	73	113
1241B	9	27	0	0	0	0	27	27	27	27
1241C	9	27	0	0	0	0	27	27	27	27
1241D	9	27	167	328	650	227	442	1,303	3,040	3,648
1241E	9	27	49	198	348	768	149	673	1,609	3,713
1241F	0	0	14	28	74	98	35	110	310	579
1248	27	101	28	113	199	439	171	470	1,004	2,205
1249	25	94	45	184	324	714	207	694	1,564	3,519
1250	35	108	11	22	57	75	134	191	343	548
1251A	23	97	12	24	64	85	127	191	364	597
1251B	12	49	6	12	31	42	64	95	179	293
1252A	3	8	2	3	8	11	12	20	42	72
1252B	42	120	3	6	15	20	127	142	182	236
1252C	3	8	2	5	13	17	14	27	62	109
1253A	26	80	3	6	15	20	87	102	143	199
1253B	53	163	4	14	25	55	172	210	277	428
1254A	106	372	13	55	96	212	406	550	808	1,388
1254B	106	372	46	90	178	59	487	725	1,204	1,367
1254C	6	21	192	376	742	247	502	1,493	3,487	4,164
1255	144	512	1,087	1,371	911	583	3,219	6,818	9,245	10,824
1256	18	53	53	215	377	831	185	751	1,764	4,039
1257	206	332	195	244	160	102	818	1,461	1,892	2,171

TABLE A-2 (Continued)
RESIDENTIAL POPULATION PROJECTIONS BY TAZ
WILLIAMS AREA TRANSPORTATION STUDY

TAZ	1995 Estimates		Housing Additions				Population			
	Units	Population	1995-00	2000-05	2005-10	2010-15	2000	2005	2010	2015
1258	209	297	291	456	366	271	966	2,008	2,823	3,418
1259	739	1,552	120	186	149	110	1,827	2,254	2,586	2,829
1260	8	27	0	0	0	0	27	27	27	27
1261	362	1,149	1	1	4	5	1,151	1,155	1,165	1,179
1262	2,080	3,151	11	14	9	6	3,178	3,214	3,238	3,254
1263	1,467	2,285	7	9	6	4	2,303	2,327	2,343	2,353
1264	1,415	2,216	33	41	27	17	2,298	2,406	2,479	2,526
1265A	13	33	20	79	140	308	82	292	667	1,510
1265B	527	1,376	175	219	144	92	1,813	2,390	2,777	3,028
1266A	228	695	21	43	114	151	748	862	1,169	1,583
1266B	25	77	13	25	67	89	108	175	355	598
1267A	11	39	3	6	15	20	46	61	101	156
1267B	22	78	3	5	14	19	85	99	137	189
1267C	1	4	3	6	15	19	11	26	66	119
1267D	55	194	3	5	14	18	200	214	251	301
1268A	1	3	2	3	8	11	7	15	37	67
1268B	2	7	2	3	8	11	11	19	41	71
1268C	53	174	1	1	3	4	176	179	188	200
1268D	28	92	2	4	10	13	97	107	133	169
1269A	0	0	2	3	8	11	4	12	34	64
1269B	0	0	2	3	8	11	4	12	34	64
1269C	7	32	2	5	12	16	38	50	82	125
1269D	159	687	0	1	2	2	688	690	695	702
1269E	79	343	1	2	4	6	345	349	361	377
1270A	275	954	1	3	7	10	957	964	984	1,010
1270B	155	538	3	6	16	22	546	562	606	666
1270C	3	11	10	20	52	69	35	87	226	414
1270D	12	43	3	6	16	21	51	67	110	168
1270E	9	32	3	5	14	18	38	52	89	138
1271A	3	11	104	202	399	133	270	803	1,876	2,240
1271B	3	11	9	18	48	64	34	82	212	387
1271C	7	26	4	9	24	32	37	61	125	212
TOTAL	16,548	36,111	9,024	15,545	21,743	20,460	58,673	97,534	151,890	203,040

Source: Applied Economics, 1996.

TABLE A-3
EMPLOYMENT PROJECTIONS BY TAZ
WILLIAMS AREA TRANSPORTATION PLAN

TAZ	Retail Employment					Industrial Employment					Office Employment				
	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015
1033	21	65	194	387	596	7	271	549	906	1,156	1	1	1	1	1
1034	148	148	148	148	148	0	246	505	838	1,071	0	64	183	312	427
1036	40	40	40	40	40	6	882	1,804	2,986	3,814	2	2	2	2	2
1038	110	189	420	767	1,142	0	0	0	0	0	2	38	104	176	240
1040	67	102	204	358	524	1	1	1	1	1	2	2	2	2	2
1042	12	32	90	178	273	0	30	61	101	129	0	18	51	87	119
1044	14	18	42	85	175	0	100	214	372	571	1	6	29	57	107
1080	38	108	313	620	952	0	0	0	0	0	0	0	0	0	0
1081	280	339	512	771	1,050	0	0	0	0	0	0	0	0	0	0
1082	66	106	223	399	588	0	0	0	0	0	0	0	0	0	0
1083	1,026	1,123	1,411	1,841	2,306	0	0	0	0	0	0	0	0	0	0
1084	64	64	64	64	64	0	0	0	0	0	0	0	0	0	0
1085	18	18	39	110	210	0	0	0	0	0	0	0	0	0	0
1111	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0
1112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1113	0	20	158	399	904	0	0	0	0	0	0	5	28	57	107
1114	79	79	79	83	94	0	0	2	5	10	0	0	0	1	3
1115A	158	158	158	165	185	0	0	2	5	10	0	0	0	1	3
1115B	0	0	0	8	30	0	0	3	7	14	0	0	0	1	3
1131	0	20	78	166	261	0	0	0	0	0	0	0	0	0	0
1132	0	0	24	108	226	0	0	0	0	0	0	0	0	0	0
1133	0	0	0	6	23	0	0	5	12	23	0	0	0	1	3
1134	37	37	37	39	45	0	0	5	11	22	0	0	0	2	6
1135A	7	7	7	11	22	0	0	5	11	22	0	0	0	2	7
1135B	7	7	7	23	68	0	0	4	9	18	0	0	0	3	9
1136A	15	15	15	15	15	0	0	9	22	43	0	0	0	0	0
1136B	20	20	20	20	20	1,196	1,196	1,196	1,196	1,196	0	0	0	0	0
1136C	5	5	5	5	5	0	0	4	9	18	0	0	0	0	0
1136D	5	5	5	5	5	0	0	4	9	18	0	0	0	0	0
1157	0	64	251	532	836	1	351	720	1,193	1,524	0	84	241	412	565
1158	0	0	0	16	61	1	1	1	1	1	0	0	0	1	4
1159	0	0	0	16	61	10	10	10	10	10	0	0	0	1	4
1160A	1	1	1	1	1	32	288	578	981	1,489	0	5	25	50	94
1160B	1	1	25	109	227	0	74	158	333	431	0	0	5	18	33
1160C	1	1	1	1	1	0	0	7	17	33	0	0	0	0	0

TABLE A-3 (Continued)
EMPLOYMENT PROJECTIONS BY TAZ
WILLIAMS AREA TRANSPORTATION PLAN

TAZ	Public Employment					Miscellaneous Employment					Total Employment				
	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015
1033	0	0	0	0	0	33	23	13	4	4	62	360	757	1,298	1,757
1034	0	0	0	0	0	10	7	4	1	1	158	465	840	1,299	1,647
1036	0	0	0	0	0	28	20	12	4	4	76	944	1,858	3,032	3,860
1038	0	0	0	0	0	53	37	21	6	6	165	264	545	949	1,388
1040	0	0	0	0	0	59	45	27	10	10	129	150	234	371	537
1042	0	0	0	0	0	0	0	0	0	0	12	80	202	366	521
1044	0	0	0	0	0	4	91	208	207	205	19	215	493	721	1,058
1080	54	54	54	54	54	155	108	61	16	16	247	270	428	690	1,022
1081	15	15	15	15	15	158	111	64	19	19	453	465	591	805	1,084
1082	73	73	73	73	73	56	39	22	6	6	195	218	318	478	667
1083	70	170	220	220	220	220	154	88	25	25	1,316	1,447	1,719	2,086	2,551
1084	0	0	0	0	0	23	27	20	13	13	87	91	84	77	77
1085	0	0	0	0	0	13	13	13	9	3	31	31	52	119	213
1111	120	120	120	120	120	7	5	3	1	1	130	128	126	124	124
1112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1113	49	49	49	49	49	0	0	0	0	0	49	74	235	505	1,060
1114	0	18	44	87	139	2	2	2	2	1	81	99	127	178	247
1115A	0	7	17	34	55	1	1	1	1	1	159	166	178	206	254
1115B	0	0	0	0	0	0	1	4	12	19	0	1	7	28	66
1131	0	0	0	0	0	0	0	0	0	0	0	20	78	166	261
1132	0	0	0	0	0	0	0	0	0	0	0	0	24	108	226
1133	0	0	0	0	0	0	0	0	0	0	0	0	5	19	49
1134	0	0	0	0	0	1	1	1	1	1	38	38	43	53	74
1135A	0	0	0	0	0	1	1	1	1	1	8	8	13	25	52
1135B	0	0	0	0	0	0	0	0	0	0	7	7	11	35	95
1136A	0	0	0	0	0	0	0	0	0	0	15	15	24	37	58
1136B	0	0	0	0	0	0	0	0	0	0	1,216	1,216	1,216	1,216	1,216
1136C	0	0	0	0	0	0	0	0	0	0	5	5	9	14	23
1136D	0	0	0	0	0	0	0	0	0	0	5	5	9	14	23
1157	0	0	0	0	0	0	85	85	85	85	1	584	1,297	2,222	3,010
1158	0	0	0	0	0	0	6	18	51	81	1	7	19	69	147
1159	0	0	0	0	0	0	6	18	51	81	10	16	28	78	156
1160A	22	22	22	22	22	1	1	1	1	1	56	317	627	1,055	1,607
1160B	22	22	22	22	22	0	0	0	0	0	23	97	210	482	713
1160C	25	25	25	25	25	0	0	0	0	0	26	26	33	43	59

TABLE A-3 (Continued)
EMPLOYMENT PROJECTIONS BY TAZ
WILLIAMS AREA TRANSPORTATION PLAN

TAZ	Retail Employment					Industrial Employment					Office Employment				
	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015
1179	6	6	6	10	21	0	0	1	3	6	0	0	0	1	4
1180A	22	22	34	76	135	3	3	3	3	3	0	0	0	0	0
1180B	22	42	180	421	926	3	3	3	3	3	0	7	38	77	145
1199A	22	31	97	212	452	0	0	0	0	0	0	0	0	0	0
1199B	22	22	22	32	60	0	0	0	1	2	0	0	0	1	3
1200	16	16	16	30	68	0	0	0	0	0	0	0	0	5	17
1201	39	39	39	39	39	4	4	4	4	4	0	0	0	0	0
1202	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	35	35	65	170	317	51	78	109	173	209	0	0	20	70	128
1204A	0	50	75	90	100	0	700	1,507	1,507	1,507	100	250	500	750	875
1204B	0	0	0	0	0	800	1,800	3,493	5,493	7,412	0	0	0	0	0
1204C	0	0	0	10	25	0	0	0	500	1,081	0	0	0	0	125
1205A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1205B	0	0	0	0	0	0	0	4	9	17	0	0	0	0	0
1205C	0	0	0	0	0	0	0	7	17	34	0	0	0	0	0
1205D	0	0	0	0	0	457	457	464	473	488	0	0	0	0	0
1205E	0	0	0	0	0	0	0	6	15	30	0	0	0	0	0
1205F	0	0	0	0	0	0	0	7	17	34	0	0	0	0	0
1205G	0	0	0	0	0	1,043	1,192	1,360	1,594	1,889	0	0	0	0	0
1215A	2	2	2	2	2	0	0	6	14	28	0	0	0	1	4
1215B	2	2	2	2	2	0	0	0	0	0	0	0	0	1	4
1216	2	2	2	2	2	0	0	0	0	0	0	0	0	1	2
1217	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1218	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1219	0	0	0	12	45	0	0	1	2	4	0	0	0	0	1
1220A	3	3	3	3	3	0	40	86	181	234	0	0	0	0	0
1220B	8	8	8	8	8	0	111	237	499	646	0	0	0	0	0
1220C	8	8	8	8	8	0	0	7	16	32	0	0	0	0	0
1227	0	0	0	2	8	0	0	0	0	0	0	0	0	0	0
1228A	0	0	0	0	0	3	3	3	3	3	0	0	0	0	0
1228B	0	0	0	2	8	3	3	3	3	3	0	0	0	0	0
1229A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1229B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1229C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1230	13	13	13	13	13	29	29	33	39	50	0	0	0	2	7

TABLE A-3 (Continued)
EMPLOYMENT PROJECTIONS BY TAZ
WILLIAMS AREA TRANSPORTATION PLAN

TAZ	Public Employment					Miscellaneous Employment					Total Employment				
	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015
1179	0	0	0	0	0	0	0	0	0	0	6	6	7	14	31
1180A	0	24	61	61	61	0	0	0	0	0	25	49	98	140	199
1180B	31	31	31	31	31	0	72	170	170	170	56	155	422	702	1,275
1199A	0	0	0	0	0	9	9	9	6	2	31	40	106	218	454
1199B	0	0	0	0	0	8	8	8	8	4	30	30	30	42	69
1200	0	134	327	648	1,032	11	55	145	393	616	27	205	488	1,076	1,733
1201	0	0	0	0	0	0	0	0	0	0	43	43	43	43	43
1202	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	0	36	92	92	92	0	70	130	170	170	86	219	416	675	916
1204A	0	900	2,050	3,200	4,350	50	53	55	58	61	150	1,953	4,187	5,605	6,893
1204B	0	250	350	400	450	0	0	0	0	0	800	2,050	3,843	5,893	7,862
1204C	0	0	0	50	100	0	0	0	0	0	0	0	0	560	1,331
1205A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1205B	0	0	0	0	0	0	0	0	0	0	0	0	4	9	17
1205C	0	0	0	0	0	0	0	0	0	0	0	0	7	17	34
1205D	0	0	0	0	0	0	0	0	0	0	457	457	464	473	488
1205E	0	0	0	0	0	0	0	0	0	0	0	0	6	15	30
1205F	0	0	0	0	0	0	0	0	0	0	0	0	7	17	34
1205G	0	0	0	0	0	0	0	0	0	0	1,043	1,192	1,360	1,594	1,889
1215A	0	0	0	0	0	0	0	0	0	0	2	2	8	17	34
1215B	0	0	0	0	0	0	0	0	0	0	2	2	2	3	6
1216	0	0	0	0	0	0	0	0	0	0	2	2	2	3	4
1217	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1218	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1219	0	0	0	0	0	0	0	0	0	0	0	0	1	14	50
1220A	1	1	1	1	1	0	0	0	0	0	4	44	90	185	238
1220B	1	1	1	1	1	0	0	0	0	0	9	120	246	508	655
1220C	1	1	1	1	1	0	0	0	0	0	9	9	16	25	41
1227	84	84	84	84	84	0	0	0	0	0	84	84	84	86	92
1228A	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3
1228B	0	0	0	0	0	0	0	0	0	0	3	3	3	5	11
1229A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1229B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1229C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1230	2	2	2	2	2	0	0	0	0	0	44	44	48	56	72

TABLE A-3 (Continued)
EMPLOYMENT PROJECTIONS BY TAZ
WILLIAMS AREA TRANSPORTATION PLAN

TAZ	Retail Employment					Industrial Employment					Office Employment				
	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015
1234	69	69	69	69	69	0	0	6	14	28	67	67	67	67	67
1235	0	0	0	0	0	88	88	91	95	101	0	0	0	2	6
1236A	0	0	0	0	0	0	0	4	9	18	1	1	1	3	7
1236B	0	0	0	4	15	0	0	0	0	1	1	1	1	1	1
1237	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1238A	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0
1238B	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0
1239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1240A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1240B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1240C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1240D	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1240E	0	32	126	266	418	0	0	0	0	0	0	0	0	0	0
1241A	0	0	0	2	8	0	0	5	12	24	0	0	0	1	3
1241B	0	0	0	0	0	0	0	7	17	34	0	0	0	0	0
1241C	0	0	0	0	0	0	0	7	17	34	0	0	0	0	0
1241D	2	5	25	59	131	1	1	1	1	1	0	1	4	7	13
1241E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1241F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1248	6	6	6	14	36	0	0	2	5	11	0	0	0	0	0
1249	0	0	0	8	30	0	0	0	1	2	0	0	0	0	0
1250	3	3	3	3	3	6	6	6	6	6	0	0	0	0	0
1251A	0	0	0	4	15	0	0	0	0	1	0	0	0	0	0
1251B	0	0	0	4	15	0	0	0	0	0	0	0	0	0	0
1252A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1252B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1252C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1253A	0	0	0	0	0	2	2	2	2	2	0	0	0	0	0
1253B	0	0	0	4	15	2	2	2	2	3	0	0	0	0	1
1254A	0	0	0	2	8	0	0	0	0	0	0	0	0	0	0
1254B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1254C	21	23	40	68	129	6	6	6	6	6	0	0	0	0	0
1255	11	13	30	58	119	12	12	12	12	12	0	0	0	0	0
1256	12	12	12	12	12	78	78	80	83	88	8	8	8	8	8
1257	6	16	45	89	137	22	22	22	22	22	0	0	0	0	0

TABLE A-3 (Continued)
EMPLOYMENT PROJECTIONS BY TAZ
WILLIAMS AREA TRANSPORTATION PLAN

TAZ	Public Employment					Miscellaneous Employment					Total Employment				
	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015
1234	2	2	2	2	2	9	9	9	9	5	147	147	153	161	171
1235	0	9	22	43	68	0	0	0	0	0	88	97	113	140	175
1236A	0	0	0	0	0	0	0	0	0	0	1	1	5	12	25
1236B	0	9	22	43	68	0	0	0	0	0	1	10	23	48	85
1237	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1238A	54	54	54	54	54	0	0	0	0	0	56	56	56	56	56
1238B	0	0	0	0	0	0	0	0	0	0	4	4	4	4	4
1239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1240A	0	15	36	71	112	36	36	36	36	18	36	51	72	107	130
1240B	0	0	0	0	0	20	20	20	20	10	20	20	20	20	10
1240C	0	7	17	34	55	41	41	41	41	21	41	48	58	75	76
1240D	0	7	17	34	55	39	39	39	39	20	39	46	56	73	75
1240E	29	29	29	29	29	35	24	13	3	3	64	85	168	298	450
1241A	0	0	0	0	0	8	8	8	8	4	8	8	13	23	39
1241B	0	0	0	0	0	8	8	8	8	4	8	8	15	25	38
1241C	0	0	0	0	0	8	8	8	8	4	8	8	15	25	38
1241D	76	249	420	463	463	7	7	7	5	2	86	263	457	535	610
1241E	0	7	17	34	55	8	8	8	8	4	8	15	25	42	59
1241F	0	0	0	0	0	8	8	8	8	4	8	8	8	8	4
1248	0	9	22	43	68	0	0	0	0	0	6	15	30	62	115
1249	0	45	110	217	346	0	0	0	0	0	0	45	110	226	378
1250	0	29	71	140	223	0	0	0	0	0	9	38	80	149	232
1251A	0	9	22	43	68	0	0	0	0	0	0	9	22	47	84
1251B	0	0	0	0	0	0	0	0	0	0	0	0	0	4	15
1252A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1252B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1252C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1253A	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2
1253B	0	0	0	0	0	0	0	0	0	0	2	2	2	6	19
1254A	0	16	39	78	124	43	50	65	107	124	43	66	104	187	256
1254B	0	7	17	34	55	43	43	43	43	22	43	50	60	77	77
1254C	38	38	38	38	38	87	87	87	62	19	152	154	171	174	192
1255	0	27	53	60	60	9	9	9	6	2	32	61	104	136	193
1256	10	17	27	44	65	0	0	0	0	0	108	115	127	147	173
1257	0	0	0	0	0	4	3	2	1	1	32	41	69	112	160

TABLE A-3 (Continued)
EMPLOYMENT PROJECTIONS BY TAZ
WILLIAMS AREA TRANSPORTATION PLAN

TAZ	Retail Employment					Industrial Employment					Office Employment				
	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015
1258	188	188	188	188	188	0	0	0	0	0	0	0	0	0	0
1259	4	4	4	4	4	1	1	1	1	1	0	0	0	0	0
1260	28	28	28	36	58	416	416	417	418	420	0	0	0	0	0
1261	15	15	15	15	15	78	78	78	78	78	0	0	0	0	0
1262	29	29	29	29	29	0	0	0	0	0	0	0	0	0	0
1263	24	24	24	24	24	0	0	0	0	0	0	0	0	0	0
1264	3	3	3	3	3	2	2	2	2	2	0	0	0	0	0
1265A	8	8	8	8	8	64	64	64	64	64	0	0	0	0	0
1265B	0	4	28	71	161	0	0	0	0	0	0	0	0	0	0
1266A	0	0	0	3	11	0	0	0	0	0	0	0	0	0	0
1266B	0	0	0	6	23	0	0	0	0	0	0	0	0	0	0
1267A	0	0	0	4	15	1	1	1	1	1	0	0	0	0	0
1267B	0	0	0	4	15	1	1	1	1	1	0	0	0	0	0
1267C	0	0	0	4	15	1	1	1	1	1	0	0	0	0	0
1267D	0	0	0	4	15	1	1	1	1	1	0	0	0	0	0
1268A	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0
1268B	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0
1268C	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0
1268D	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0
1269A	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0
1269B	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0
1269C	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0
1269D	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0
1269E	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0
1270A	18	18	18	18	18	8	8	8	8	8	0	0	0	0	0
1270B	0	0	0	0	0	8	8	8	8	8	0	0	0	0	0
1270C	0	0	0	0	0	8	8	8	8	8	0	0	0	0	0
1270D	0	0	0	0	0	8	8	8	8	8	0	0	0	0	0
1270E	0	0	0	0	0	8	8	8	8	8	0	0	0	0	0
1271A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1271B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1271C	0	0	0	2	8	10	11	16	26	38	0	0	0	0	0
TOTAL	2,930	3,611	5,867	9,753	15,189	4,489	8,713	14,073	20,548	26,391	185	560	1,310	2,185	3,160

Source: Applied Economics, 1996.

TABLE A-3 (Continued)
EMPLOYMENT PROJECTIONS BY TAZ
WILLIAMS AREA TRANSPORTATION PLAN

TAZ	Public Employment					Miscellaneous Employment					Total Employment				
	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015	1995	2000	2005	2010	2015
1258	0	0	0	0	0	6	4	2	0	0	194	192	190	188	188
1259	0	0	0	0	0	2	1	0	0	0	7	6	5	5	5
1260	5	16	32	59	91	0	24	71	201	322	449	484	548	714	891
1261	0	0	0	0	0	0	0	0	0	0	93	93	93	93	93
1262	25	25	25	25	25	10	7	4	1	1	64	61	58	55	55
1263	0	0	0	0	0	1	1	1	1	1	25	25	25	25	25
1264	0	0	0	0	0	3	2	1	0	0	8	7	6	5	5
1265A	0	0	0	0	0	3	3	3	2	1	75	75	75	74	73
1265B	0	0	0	0	0	2	43	97	96	95	2	47	125	167	256
1266A	0	9	22	43	68	0	0	0	0	0	0	9	22	46	79
1266B	0	9	22	43	68	0	0	0	0	0	0	9	22	49	91
1267A	0	0	0	0	0	0	0	0	0	0	1	1	1	5	16
1267B	0	9	22	43	68	0	0	0	0	0	1	10	23	48	84
1267C	0	9	22	43	68	0	0	0	0	0	1	10	23	48	84
1267D	0	0	0	0	0	0	0	0	0	0	1	1	1	5	16
1268A	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
1268B	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
1268C	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
1268D	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
1269A	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3
1269B	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3
1269C	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3
1269D	28	28	28	28	28	0	0	0	0	0	31	31	31	31	31
1269E	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3
1270A	0	0	0	0	0	0	0	0	0	0	26	26	26	26	26
1270B	0	0	0	0	0	0	0	0	0	0	8	8	8	8	8
1270C	10	66	146	280	440	0	0	0	0	0	18	74	154	288	448
1270D	0	0	0	0	0	0	0	0	0	0	8	8	8	8	8
1270E	0	7	17	34	55	0	0	0	0	0	8	15	25	42	63
1271A	0	7	17	34	55	0	0	0	0	0	0	7	17	34	55
1271B	0	51	124	245	388	0	0	0	0	0	0	51	124	245	388
1271C	0	0	0	0	0	0	0	0	0	0	10	11	16	28	46
TOTAL	847	2,860	5,173	7,673	10,361	1,343	1,544	1,794	2,044	2,294	9,794	17,288	28,217	42,203	57,395

Source: Applied Economics, 1996.